THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXII. No. 1855.] LONDON, NOVEMBER 29, 1898. [50TH YEAR. PRICE 6d.

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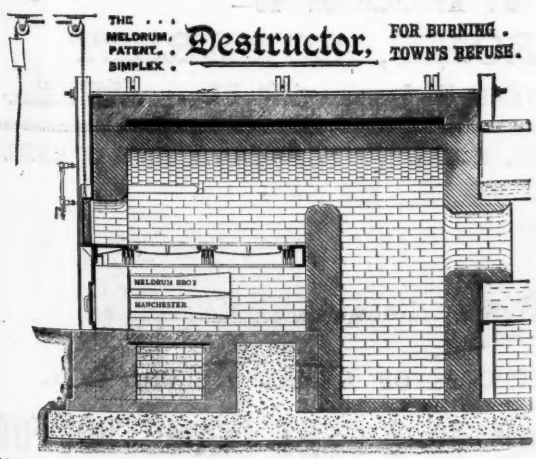

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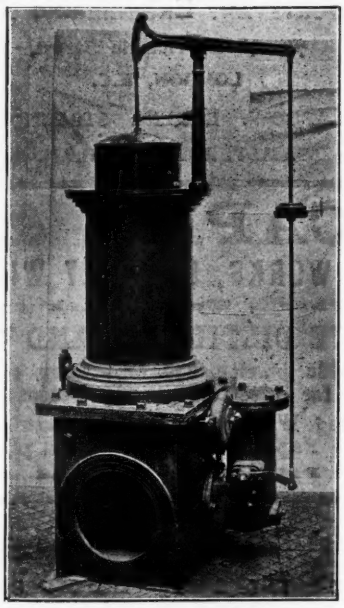

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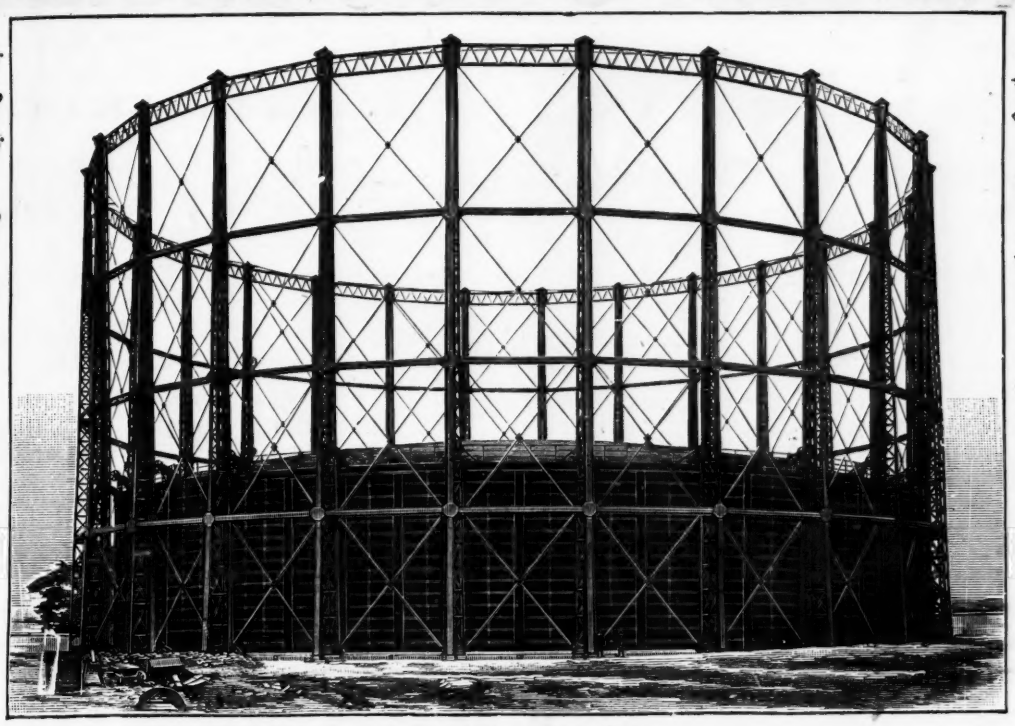

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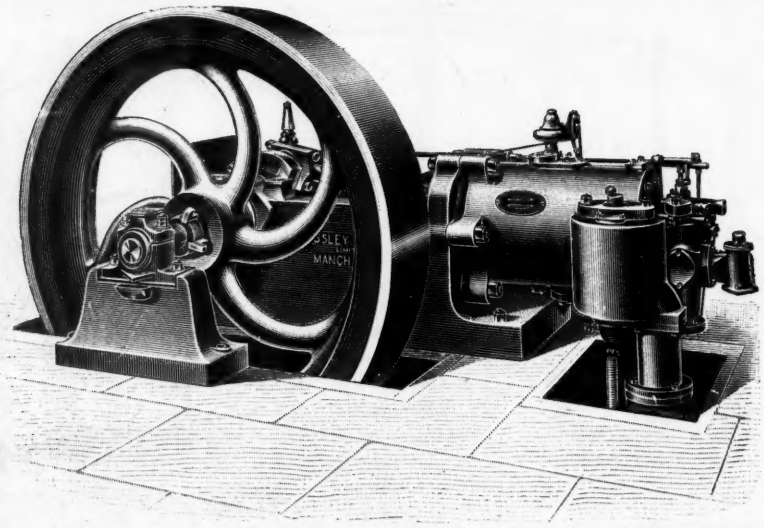

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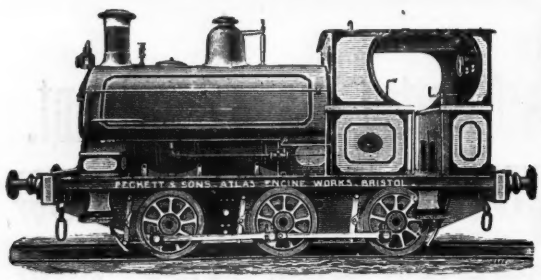

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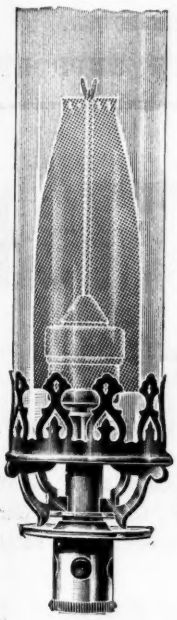

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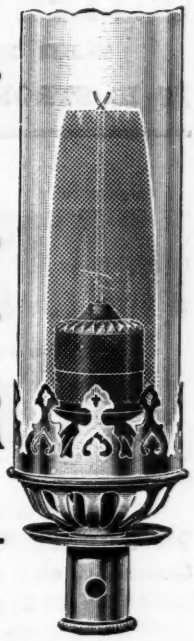

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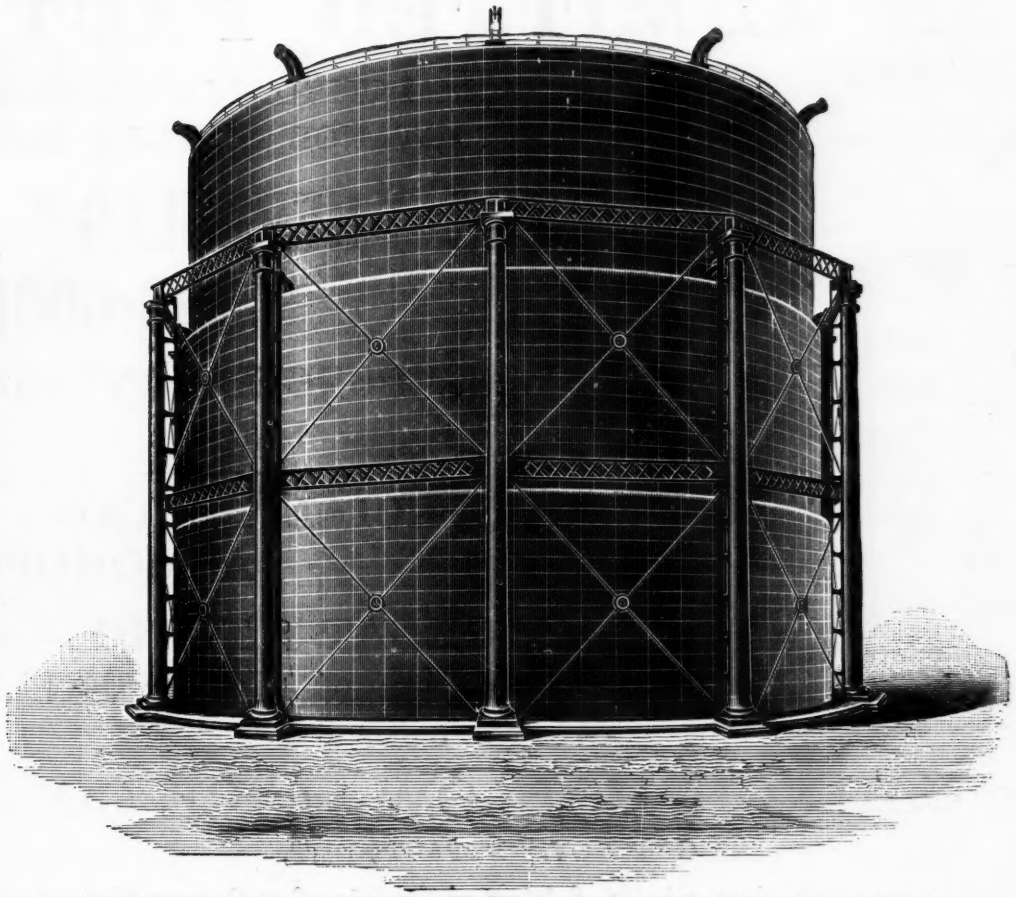

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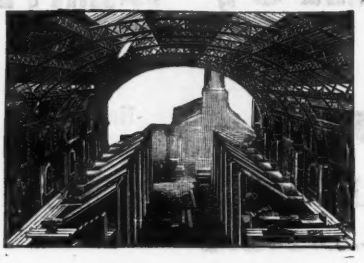

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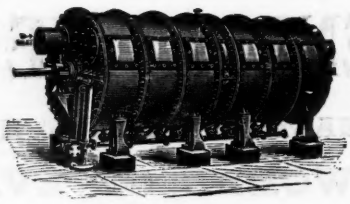

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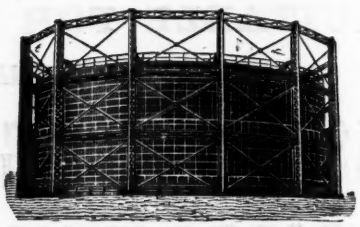

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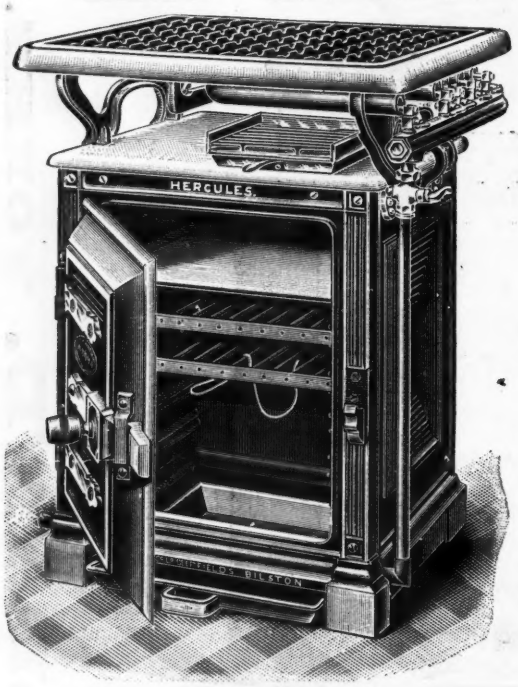

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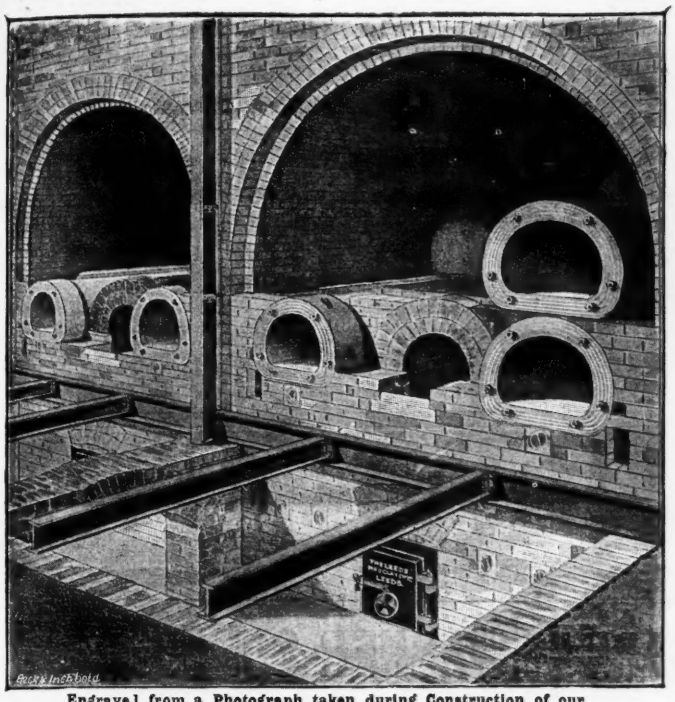

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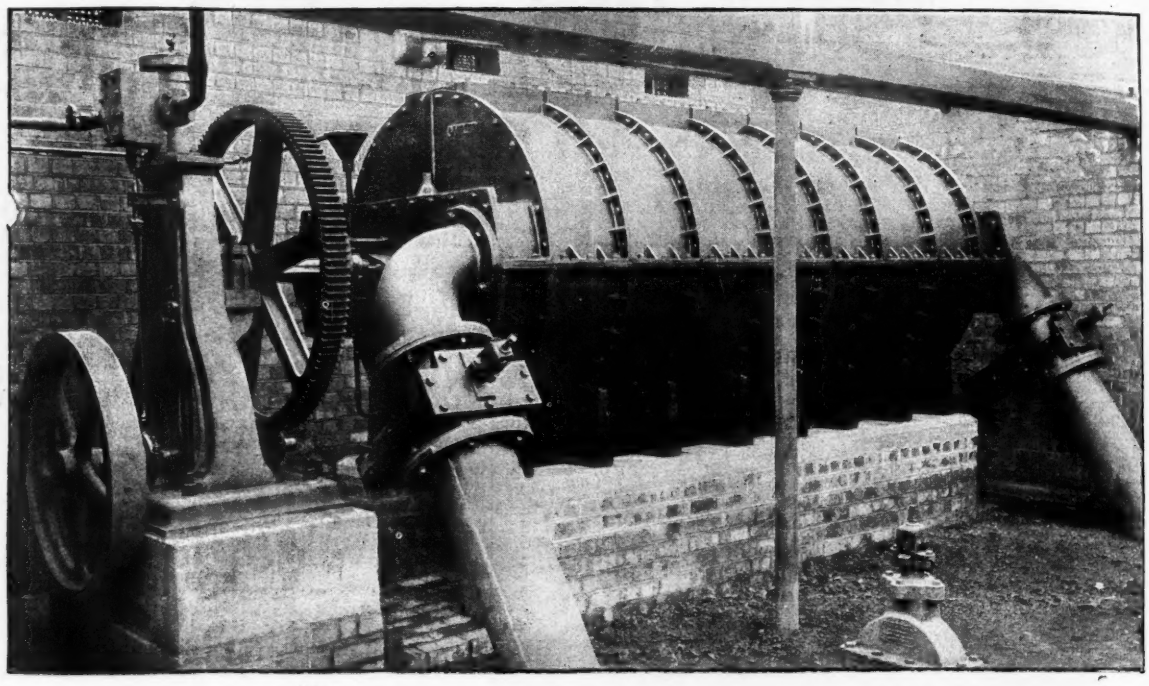

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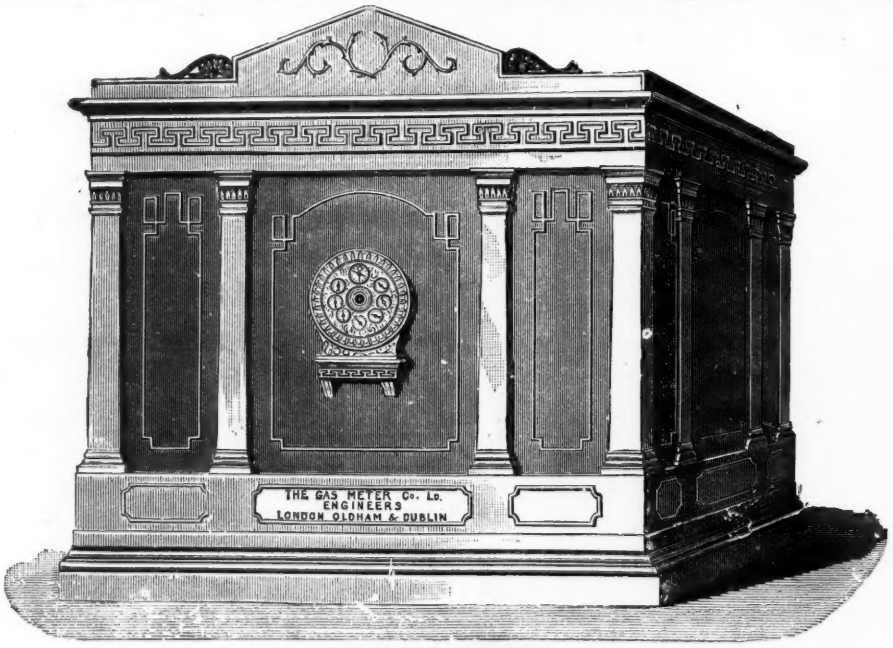

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Bridlington	125,000
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Bremen	550,000
Maidenhead	225,000
Epsom	225,000
North Middlesex	150,000
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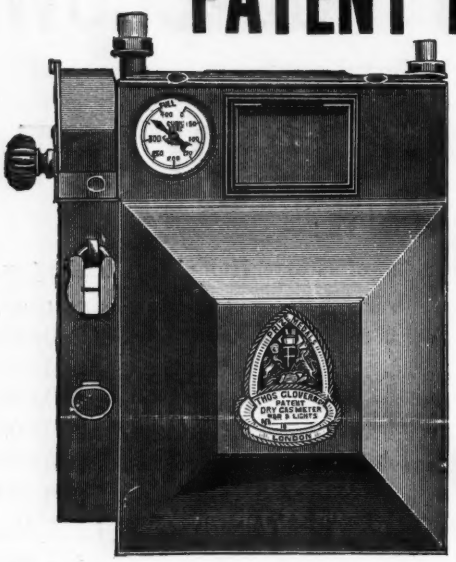

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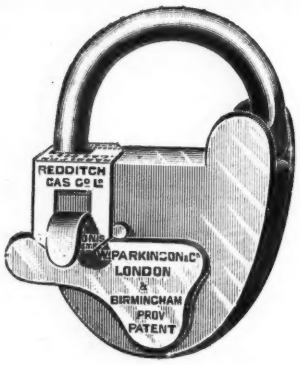

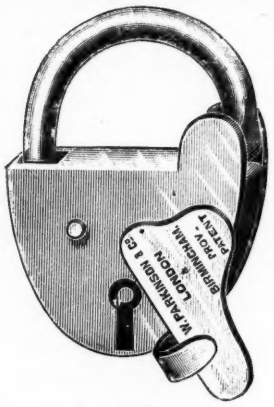

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EDITORIAL NOTES.

The Interpretation of the Workmen's Compensation and Other Acts.

IT is to be expected that many attempts will be made to induce the Courts to stretch the operation of the Workmen's Compensation Act with the object of making it include injuries to which it does not explicitly apply. It is one of the standing complaints of the political party which has not the credit of passing the Bill, that it leaves out a large number of hard cases in which compensation is richly deserved. Obviously, this is a very cheap and easy kind of criticism; but it is also extremely futile. Neither is it fairly to be alleged as a defect of the Act that a good many people now outside it will continually trouble the Law Courts with demands for admission into the protected ranks. The Act is large enough, in all conscience, though for good and sufficient reasons it was not drawn to include all workmen and every kind of industrial injury. Take merely the case of trade injuries, such as the damage to health traceable to working at a "noxious" process. This is an order of injuries which the framers of the measure deliberately excluded; yet Judge Addison, at the Southwark County Court, was asked last week to adjudicate upon a claim for compensation for "painter's colic." The answer of the employer was that this class of injury is not an "accident" coming within the meaning of the Act. The defence prevailed; the Court holding that the meaning of the word "accident" in the Act of Parliament is the ordinary, and not the broad or philosophic one. This is a kind of legal judgment which is greatly to be applauded, on general grounds. Apart altogether from the question of interpreting a word in a particular statute, it is a point of public policy of the greatest importance that the simple, every-day language in which it has become customary to draft our Acts of Parliament should receive common-sense, plain interpretation in the Courts. Ancient legal phraseology was a terrible bugbear. There used to be a humorous skit upon it, in the form of a deed of gift of an orange, which ran into many folios. It is unnecessary to go into this subject at length, on the text of Judge Addison's admirable judgment. It is a consideration, however, that needs to be borne constantly in mind by those who have to do with the drafting and interpretation of legal documents of all kinds, from Acts of Parliament down to the patent specification of an amateur. So-called legal fictions, laboured diction, and all the hair-splitting refinements of scholastic philosophy which have lingered so long in our Law Courts, are out of date. Let an Act, or any private instrument, be only couched in plain, ordinary language, and then the Courts will deal with it in a few minutes.

The foregoing observations are thoroughly borne out by the character of the proceedings in the case of *Suckling v. The Gaslight and Coke Company*, which we report at length in our "Legal Intelligence" to-day. This is the first action of its kind brought by a gas worker against his employers since the Workmen's Compensation Act came into operation; and the circumstance of its being brought under the Employers' Liability Act, 1880, instead of under the latest Act, exemplifies much that has been said concerning the concurrent operation of these statutes. The plaintiff, a sufferer originally from gas poisoning contracted while assisting to empty a foul purifier at Beckton, alleged that his injury was due to the existence of defects in the works chargeable to the negligence of the Engineer of the station (Mr. Thomas Goulden). This plea comes in under the Act of 1880, which expressly makes the master liable to pay compensation when the injury is caused by the personal negligence or wilful act of some person for whose act or default the employer is responsible. A workman who thinks he has a case of this character against his employer, will always be advised by his Union or by his attorney to proceed under the Act of 1880, because in the event of his gaining the day a sympathetic Jury will be able to award him more money than would be given under the Act of 1897. On the other hand, it is obvious that the risks of such a proceeding are greater. In the case in point, the opening address of the plaintiff's Counsel, Mr. Ruegg, contains several piquant revelations of the peculiar conditions under which work at Beckton is carried on. It looks very much as if the purifier gangs asserted their right to work or not, pretty much as they pleased. The plaintiff, by his

own admission, could not say that there was any precedent for the supposition, by Mr. Goulden or by anybody else, that there was anything unusual about the work he was expected to do. The purifier hands are paid by the piece, and have to take the rough with the smooth. It was alleged that this particular purifier was in an exceptionally bad condition when, at 3 o'clock on a very hot August day, the gang to which Suckling belonged had orders to get into it. Naturally, all his mates swore to the dreadful state of the purifier; but still it did not appear how Mr. Goulden was responsible for the condition of the lime, or the heat of the weather, or the bodily state of every member of the purifier gang.

The case for the defendants was chiefly made up of medical testimony, and the evidence of Mr. Goulden and his assistants. The former went to show that the plaintiff's injury, such as it was, had not arisen only from the state of the purifier. Mr. Goulden's evidence, corroborated by that of Mr. J. N. Reeson and of the foreman, Mr. Berry, put a complexion upon the whole affair differing entirely from the plaintiff's assertions. The gang did not want to start a fresh job at 3 o'clock on a very hot afternoon. The discharging of a foul lime purifier is not pleasant work; and the plaintiff had probably already had quite enough of it for that one day, his health not being particularly good. Mr. Goulden had to deal, not for the first time, with a set of men who shirked their work. He acted upon his judgment of what was necessary to be done. An unpleasant feature of the case was the use that was attempted to be made of Mr. Goulden's kindness to the sufferer and his family; but when it came to the bolstering-up of the claim by the "independent" testimony of the local Secretary of the Gas Workers' Union, the scheme was effectually "blown." The Counsel for the Company reminded the Jury that there was no necessity for them to allow their judgment to be warped by sympathy for the working man, because the plaintiff could have had his compensation under the Act of 1897 without being under the obligation to convict his employers of culpable negligence. It was not the suffering workman, but really the Gas Workers' Union, who "went for" Mr. Goulden and the Company. In the event, the Jury found for the defendants, which is a result of the utmost value for them and for all gas manufacturers. If the case had been decided otherwise, it is doubtful how the work of gas making could have been carried on at all.

The Parliamentary Notices.

In another column we give the Parliamentary Notices for the ensuing session relating to gas and water supply. The number of Bills promised is large; and some of them are of great importance. Many considerable Provincial Gas Companies are coming to Parliament next year for additional powers; and the incorporation of new Gas Companies keeps pace fairly with the municipalization of established undertakings. The most generally interesting application is that of The Gaslight and Coke Company, who are in want of more money, additional land, and some minor facilities. Unless all the warnings of the past two or three years mean nothing, there will be a great fight over this Bill. The Bristol Gas Company are preparing a Bill for various purposes; as also are the Cambridge University and Town Gas Company. Westward and eastward, the gas undertakings grow and prosper. A conflict of Bills is promised for Ilford. A general gas supply scheme for Mid-Kent is in contemplation. Altogether, next session promises to be a bustling one for the able gentlemen whose business it is to settle the conditions under which statutory gas supply is to be carried on in the United Kingdom. It is, of course, impossible to discuss the nature of parliamentary projects upon the notices; but one of the most ambitious of these statutory formulæ relates to Hastings and St. Leonards. Several London Suburban Gas Companies require additional powers. A respectable amount of Scotch business is in hand; but there is not a single application for a Gas Bill from Ireland.

The Manchester Institution Meeting.

A very successful year's work was completed on Saturday by the Manchester District Institution of Gas Engineers, under the presidency of Mr. W. S. Haddock, of Warrington. Recognizing the ever-increasing difficulty experienced by all the District Associations in inducing members to submit formal papers at the ordinary meetings, the Manchester Committee tried the experiment of arranging for two of the members to "introduce" subjects for discussion; and the experience of Saturday is likely to be repeated, with equal success, if only the members selected will undertake to prepare something worth listening to, as Mr. Shadbolt and Mr. Brearley did on the present occasion. The former gentleman has previously distinguished himself by his contributions to the proceedings of this and kindred Associations; and on Saturday his running comment on a series of tabulated statements with which he had furnished the members, was of a character eminently calculated to raise a useful discussion, besides furnishing comparative figures of purification results that will doubtless be appreciated outside the Institution itself. Mr. Brearley made his first appearance as an author of a well and lightly written paper, dealing exhaustively with some of the items of a Gas Company's accounts that need very careful consideration before determining whether they should be carried to capital or revenue, and in what proportion they ought to be divided should part of the sum be chargeable to both accounts.

The latter paper, and the series of tables with which it is accompanied, call attention once more to the continued rapid municipalization of the gas undertakings in the district covered by the Institution. At the present time a good half of the works represented by the members belong to the Local Authorities; and those still under Company control cannot account for more than a tithe of the capital invested. By far the largest of the latter class is that of the Ashton-under-Lyne Gas Company—if exception be made of the Liverpool United Gas Company, one of the Works Managers of which still nominally belongs to the Institution, though it is years since he attended any of the meetings. Mr. Brearley was able to invest the usually dry subject of figures with fresh interest; and he may well look forward with pleasure to a full discussion of his conclusions at the next meeting of the members in February. His data will afford many chances of an effective comparison of Corporation as contrasted with Company control of the gas supply of large and small districts.

It remains to notice that the members occupied their morning with a visit to the Bradford Corporation Chemical Works at Frizinghall, where they were received by Mr. Charles Wood, the Gas Engineer, and Mr. John Wyld, the Manager of the Chemical Department, and were able to appreciate the advantages of treating the residuals as an integral part of the economy of gas manufacture rather than disposing of them to an outside buyer. After lunch, a vote of condolence was passed with the widow and children of the late Mr. Robert Hunter; and Mr. S. S. Mellor, as Hon. Secretary, made a verbal report about the fund being raised by the Committee (among the members only) for the relief of the family, and already amounting to considerably over £100. This and the fund being acknowledged from week to week in the "Journal" will be a welcome addition to Mrs. Hunter's slender resources. The action of the Council of The Gas Institute in the matter of the standardizing of meter-unions engaged brief attention before the meeting closed. During the afternoon, Mr. Shadbolt was elected President for 1899; and a very popular leader he promises to become.

Mr. G. S. Raworth on Municipal "Avarice."

It is not often that the conduct of British Municipalities in respect of gas supply is intelligently criticized by a stranger to the industry; which is to be regretted. The dealings of local authorities with gas consumers furnish such valuable information respecting the working of Municipalism, as contrasted with the theory that they ought to be much more regarded than they are outside the technical Press. In the course of a Presidential Address recently delivered to the Northern Society of Electrical Engineers, Mr. G. S. Raworth broke new ground in this direction; thus giving welcome evidence that the peculiar notions of gas-works administration cherished by certain English towns are attracting notice from outsiders. Mr. Raworth was considering the various influences that affect the progress of the electrical industries; and among them he discovered the "Avarice of Municipalities," as illustrated on the largest scale in connection with gas supply. The same thing might be expected to operate upon electricity supply, only that this business is too young to furnish reliable evidence of the influence of policy as distinct from personalities.

Falling back for an argument on the Board of Trade Returns of Authorized Gas Undertakings, Mr. Raworth

picks out the example of Manchester—"a city which manages its gas-works nearly as well as they can be managed by a Corporation." Testing the performance of the Manchester Gas Department by that of the South Metropolitan Gas Company of London, or of the Sheffield United Gas Company, Mr. Raworth finds the Corporation sadly wanting. Nor does Birmingham come off better at the hands of this scathing critic, who appears to think it is a piece of impudence for a Corporation comparing so poorly with the Sheffield Company as regards gas supply to aspire to command the local electric lighting. Wigan and Plymouth, and Stoke-upon-Trent and the British Gaslight Company (Potteries), are also pressed in to show that Municipalities take the whole of their apparent gas profits out of the pockets of the consumers—"that is to say, of "their ratepayers." This is surely great daring on Mr. Raworth's part. The "Electrical Review" censures him, not for exposing the thing, but for calling it "avarice." The term is condemned as objectionable, and as likely to "stir up feelings of animosity in the breasts of town councillors, and make even the plain places rough in the paths "of companies approaching them for concessions." For this not very lofty consideration, Mr. Raworth is blamed as having "committed a grave error of judgment." Our contemporary is distressing itself in vain. Mr. Raworth or anybody else may abuse profit-hunting by Municipalities as heartily as he pleases; he will effect nothing, change nothing, and offend nobody. The Municipalities will act upon their interpretation of the law, and grab the profits until Parliament intervenes to restrict their rapacity.

Upon another point the criticism of Mr. Raworth by the "Electrical Review" fails. Our contemporary ventures upon the declaration that, "in the natural order of "things, Companies and Municipalities must ever be at "war. Companies exist and operate for the benefit of "individuals, Municipalities for the benefit of the body "politic." What a confusion of economical ideas, and disregard of the practice as compared with the theory of Municipalism does this passage betray! Has the suspicion never entered the mind of our contemporary that perhaps in some respects the Municipality, as an organization, may have interests not identical with those of the community which it represents? Apart from the gross consideration of the possibility of official corruption, is it a tenable proposition that the Local Authority can always and to any extent be trusted to act in the best interests of the body politic? If so, what is the good of the Local Government Board, not to mention the Treasury and the Board of Trade? And the "individuals" for whose benefit Companies are alleged to exist and operate, does this mean only the proprietors? If it were a case of selling eggs, would not the consumer go where he could get the greatest number for a shilling, regardless of the status of the vendors? Why not judge the trade in gas or electricity by exactly the same standard? This is precisely what Mr. Raworth does; and the "JOURNAL" has done it before him. Perhaps "avarice" is not absolutely the correct word to use for the profit-grasping habit of certain Municipalities; but it will serve as well as another. Called by any other name, the practice remains still unsavoury.

Falmouth Ratepayers Reject the Proposed Gas and Water Works Purchase.

MUNICIPALIZATION has no charm and water gas no terrors for the majority of the ratepayers of Falmouth. For the second time, they have rejected the Corporation's scheme for the purchase of the gas and water works; and the latest vote is so decisive that, in all probability, nothing more will be heard of the matter. In regard to the gas-works, this will almost certainly be the case. The Corporation have been tempted to twice put the question to the test because of the existence of a clause in the Falmouth Gas Act giving them the option of purchase within a certain period of the passing of the Act. This term expires next year; and as the ratepayers have put their veto upon the proposal to take advantage of the clause, there is an end to that part of the scheme. As to the water-works, the result will in all probability be much the same, though it will be reached in a different way. A great deal has been said against the water supply, chiefly, we imagine, with the idea of convincing Parliament that the price to be paid for the undertaking ought to be a low one. There is a party in Falmouth which professes to be convinced of the absolute necessity of the water-works being under public control, in order that measures, which they say are necessary, may be taken to ensure the purity of the water. It is admitted, however, that the Corporation cannot acquire the works and carry them on without adding very considerably to the burdens of the ratepayers. In these circumstances, the demand for the municipalization of the water-works, and of the gas-works, is likely to die down. Unfortunately for Falmouth, the agitation has raised questions both as to the quality of the water supply and the supposed poisonous nature of the gas, which may seriously affect its reputation as a health resort. So far as the gas supply is concerned, much has been said and written which is perfectly ridiculous; and the same may, no doubt, be said of the allegation respecting the water. But these ridiculous things, though obviously not credited in Falmouth, are believed by people who have no means of getting at the truth; and if the town should prove to have fallen into ill odour, the indiscreet friends of Municipalization will be alone to blame.

A Variant of Allen v. Flood.

AN instructive illustration of the law as laid down in the leading case of *Allen v. Flood* has just come to hand from Ireland. It originated similarly in a Trade Union proceeding, and is recorded in the Irish law reports under the name *Leathem v. Craig and Others*. The plaintiff sued the defendants, who were Trade Union officials, for having induced some employees of his to break their contracts of service to his detriment. A Belfast Jury awarded the employer £200 damages for this wrong; but judgment was held over until the decision of the House of Lords in *Allen v. Flood* was known. The Court held that the proceeding of the defendants was covered by this decision, and entered judgment for them accordingly. The plaintiff appealed, with success. The Irish Queen's Bench Divisional Court has now distinguished between this case and *Allen v. Flood*, on the highly important point that in the former there was a specific contract of service which was broken, whereas the House of Lords held that no contract whatever existed in the case of the Thames-side shipbuilders, who were employed by the hour. The main point in *Allen v. Flood* was that the question of motive does not arise in connection with the performance of a legal act. In the Irish case, the circumstances were totally different. The plaintiff's men were working under a contract of service, which was illegally broken by the defendants' provocation and inducements. The "moral" for employers is obvious. It is believed to be a delusion of professional Trade Unionists that if several hundreds, or thousands, of workmen broke their contracts of service at once, in the high and holy cause of a "strike to order," the law would be paralyzed before such a revolt, and would hesitate to multiply penalties. Workmen would be very ill advised if they were to trust to any such fond belief.

Further Complaints Concerning the Smoke Nuisance.

THE appeal of Sir W. B. Richmond for help towards the suppression of the smoke nuisance in London, has evoked a good deal of more or less pointed comment. In the first place, it has transpired that the London County Council are not so utterly oblivious of their duty in this respect as was suspected, on general principles, by "The Times." By a notable coincidence, the same week that brought Sir W. B. Richmond's complaint, witnessed the conviction of a Lambeth firm for continued smoke nuisance, at the instance of the London County Council, after the Vestry had neglected to take proceedings. The defendants called as witnesses on their behalf the Medical Officer of Health and the Vestry's Smoke Inspector. Still they were fined. This action delivers the County Council from utter condemnation; but inasmuch as "one swallow does not make a "summer," a single penalty exacted from a manufacturing firm who were probably no worse than their neighbours, does not prove that the law is being satisfactorily enforced. Meanwhile, expression has been given to the general understanding that factory chimneys, even those of electric light works, are not the sole, or even the chief, cause of the smoke in the atmosphere of London and other English towns. Another "Richmond" has entered the newspaper field, with the object of reminding the public that "firesides" are just as culpable in this regard as factories. By way of showing what is being done by the London Gas Companies to convert householders to the use of gas for heating and cooking, Mr. E. W. T. Richmond informs the readers of "The Times," on the authority of Mr. G. F. L. Foulger,

Chief Distributing Engineer of The Gaslight and Coke Company, that this Company have now on hire "as many stoves "as placed side by side would reach from Charing Cross to "the West Pier at Brighton, and 50 miles back again." It is a picturesque way of stating the fact, of which newspaper readers will take more notice than of a dry numeral. Let us hope the "return track" will soon be completed. In South-east London, where the South Metropolitan Gas Company cater for the artisan population, some 70,000 out of a possible 100,000 working-class homes are now using gas for cooking, "and the minority are coming over to the "majority at the rate of 150 a week." The same thing is going on all round the fringe of the Metropolis. Yet, as we have often urged in these columns, so much more might be done with gas-fires in London. Every hotel, every residential chamber, every office building and warehouse in London, might with advantage be warmed by gas. Another correspondent of "The Times"—Mr. H. E. Mitchell—exhibits the real remedy for the smoke nuisance in the observation that "already some residents allow "nothing but gas-fires to be used in their houses." He further declares that, "until some such means of dealing "with the open grates in the town can be arrived at, "by mutual consent or otherwise, just so long must we "submit to fogs, or perhaps, I should say, black fogs." How do the numerous public buildings of London and the larger provincial cities stand affected in this regard? Do the national and local governing bodies use gas-fires as much as they might in their own buildings of every description?

THE "ROBERT HUNTER FUND."

THIRD LIST OF CONTRIBUTIONS.

WE have pleasure in acknowledging some further contributions, as below, towards this fund; and, in doing so, we would direct attention to the report appearing elsewhere of the proceedings of the Manchester District Institution of Gas Engineers last Saturday at Bradford. It was there stated that the Committee of the Institution, who are themselves getting together a fund among the members for Mr. Hunter's family, intend holding a meeting next Tuesday with a view of closing their fund, and determining the best means of applying the money received in response to their appeal. As it is most desirable for some indication to be forthcoming of the amount likely to be realized by the two funds, we venture to ask those intending to subscribe to the "JOURNAL" fund to send in their contributions without further delay, so that the final list may, if possible, appear in our next issue.

THIRD LIST.

	£	s	d
Amount already acknowledged	118	11	0
Anon—Matt. XXV., 40	3	3	0
Belton, Mr. W., Shrewsbury	2	2	0
Beynon, Mr. R., Torquay	1	1	0
Bury, Mr. J. Oswell, Chairman, Wrexham Gas Company	1	1	0
Cocker, Mr. J. Lees, Merthyr Tydfil	2	2	0
Dempster, Messrs. R. & J., Manchester	10	10	0
Dougall, Mr. A., Hull	2	2	0
Evening Star Lodge of Freemasons	10	10	0
" from the Benevolent Fund, per Bro. T. H. Martin, Treasurer	10	10	0
Gas Purification and Chemical Company, Limited	3	3	0
Glover & Co., Messrs. Thomas, Clerkenwell	5	5	0
Hunt, Mr. Charles, Birmingham	2	0	0
Paterson, Mr. R. O., Cheltenham	5	0	0
Read, Mr. John, Tunbridge Wells	1	1	0
Smythe, Mr. H., Maidstone	1	1	0
Stelfox, Mr. J., Belfast	1	1	0
Wright & Co., Messrs. John, Birmingham	10	0	0
	£190	3	0

Professor Lewes on Acetylene.—At the Society of Arts last night, Professor Lewes delivered his second Cantor lecture on "Acetylene." He dealt with its commercial production from carbide of calcium, described the electric furnace and the various modifications of it at present in use for the manufacture of carbide, and showed how this material could be produced without electrical power. The lecture was illustrated by experiments, diagrams, and lantern views of works for the manufacture of carbide.

WATER AND SANITARY AFFAIRS.

THE Royal Commission on the Water Supply of the Metropolis, the members of which met yesterday, held only one public sitting last week, on which occasion evidence was taken from Mr. Reginald E. Middleton. If there was nothing very startling in Mr. Middleton's statement, it was nevertheless of a practical and common-sense character. He considered that if the undertakings of the Water Companies were purchased by a public authority, and if the water-rates were reduced to one level for all London, there would be a loss to the consumer and still more to the ratepayer. We hardly see that the consumer would lose. None would pay more than at present, and others would pay less. But the ratepayer would have to make good the loss on the entire transaction, which would be heavy; and in all cases in which the consumer was a ratepayer he would inevitably suffer in the latter capacity. But Lord Llandaff told Mr. Middleton that it was contrary to the evidence to assume that if the London County Council purchased the undertakings they would reduce the rates to the lowest level. We certainly think it is very unlikely they would do so; but it is difficult to see how there can be a partial levelling up, so as to establish a medium line. The most likely plan would be to lower some of the higher rates, and leave the lowest where they are. There would still be a loss, and the ratepayer would have to bear it. In whatever shape the problem is framed, water has to be paid for as truly as any other commodity; and the consumer can only gain at the cost of the ratepayer. But another question presents itself, as propounded to Mr. Middleton by Sir John Dorington. If the Companies are extinguished, a valuable ratepayer will be lost. Last year, as will be seen by Mr. Lass's "Analysis," the Metropolitan Water Companies paid no less than £238,000 in rates and taxes, exclusive of income-tax. This sum would fall on the general rate if the Companies ceased to exist. It cannot be said that all this is now charged in the water-rates. Its effect, with a very slight exception, if any, is to operate in reduction of dividend. It is a good round sum, and the Administrative Vestries and District Boards of the Metropolis, the School Board, and the Boards of Guardians, together with the London County Council, take the greater part of it. As an item of expenditure, this charge for rates and taxes absorbs 11 per cent. of the gross income of the London Water Companies. A further consideration consists in the fact alluded to by Mr. Middleton—that, in the event of purchase, all the extra outlay due to frosts and droughts will have to be defrayed by the ratepayers. As for the economies to be effected by municipal management, Mr. Middleton failed to believe in them. Eight engineers, eight secretaries, and the like, might not be required, so far as the outward form was concerned; but the work of all these would have to be done and paid for. The extent to which the County Council have managed to secure contractors' profits is perhaps some index to the probability that they will give London the benefit of the profits earned by the Companies.

A signal event in the history of the water controversy occurred last week, in the appearance of Lord Balfour of Burleigh as a correspondent in "The Times," defending the report of the Royal Commission of 1892 against the attacks made upon it, especially by Lord Farrer. The main point in Lord Farrer's argument was an insistence on the minimum flow of a river—the Thames or the Lea—as the measure of its capability to furnish a continuous supply of water. In this contention the question of storage is altogether set aside; and yet this is the device by which it is intended to rectify the minimum. All that Lord Burleigh's Commission recommended was based on the provision of adequate storage; and it has been the object of the County Council, as far as possible, to prevent such provision, in regard to both Metropolitan rivers. Lord Balfour turns the tables on Lord Farrer, by showing that, if storage is to be disregarded, the famous Welsh scheme itself comes to the ground. As for the merits of that scheme compared with the Thames, Lord Balfour would not consider one project as alternative to the other. Some day both may be needed. If there has been delay in the consideration of the Welsh scheme, and in securing an area in Wales before all those which are available are occupied, Lord Balfour says that such delay has not been

because the Welsh project was rejected upon its merits, but because the impression had been given that the object of the Council was to bring water from Wales "in com- "petition with, and for the purpose of depreciating the "value of, the existing methods of supply."

Water is now flowing more freely in the East London district; the welcome change commencing the middle of last week. The Special Correspondent of "The Times," whose articles respecting the East London water supply have been marked by extraordinary acuteness and completeness of information, very aptly says, in regard to immediate provision, "the public should notice that it is "possible to make East London safe, that the Companies "are anxious to do it, and that the County Council are oppo- "sing them." The reason for this opposition is that which we stated last week, as expressed by the Council's legal representative before the Royal Commission. "The Times" Correspondent, in referring to the "surprising frankness" of the acknowledgment made on that occasion, says that those who have followed the proceedings of the Council "have long been convinced the Progressive policy has "been to force a breakdown upon the Companies; but "such a cynical avowal was not expected." The inter-communication scheme was to be frustrated, so that the East London Company's undertaking might be purchased at a reduced rate. We observe that the Hackney Vestry, always eager to attack the Water Companies, are seeking, in their own small way, to forward the policy of depreciation. They have issued a notice, specified as "By Order," advising the inhabitants "as a precautionary measure, to "boil all water to be used for drinking purposes." Alarm is naturally created by such a notification, and a suspicion of typhoid is excited. Official and scientific reports of the highest character are thus set at naught, and people are worried into the exercise of wholly unnecessary precautions. The Hackney "Notice" is an absolute libel, only unfortunately not actionable. Perhaps it is an act of revenge for the failure of the Vestry to find any foothold for carrying on their threat to sue the East London Company before the Railway and Canal Commission for damages on account of the four hours' supply.

The Lee (popularly called the Lea) Conservancy Board, as at present constituted, apparently fails to satisfy the authority at Spring Gardens. The several objects sought in the General Powers Bill to be promoted by the County Council in the coming session include the dissolution of the present Conservancy Board and the constitution and incorporation of a new Board. Failing to accomplish so much, power is to be sought to reconstruct the existing Board; and a variety of changes are proposed, of which it is difficult at present to see the meaning, though we obtain a sufficient clue by the proposal to alter or amend certain Acts of Parliament relative to the New River and East London Water Companies. The effect may be little or much; but we may infer that the design is in some way to strengthen the position of the Council against the Water Companies. As at present constituted, the Lea Conservancy Board has five representatives from the landowners, one from the bargeowners, one from the Local Authorities, two from the New River Company, two from the East London Company, one from the Corporation of the City of London, and one from the London County Council. By the Bill of which notice has been given, the representation will be extended, so as to include the Corporation of West Ham and the County Councils of Middlesex, Essex, Bedford, and Herts. No doubt the intention is to swamp the Water Companies, and enlarge the authority of the London County Council. But more will be known when the Bill appears.

The Water Supply of German Towns.—We have just received from Herr W. H. Lindley, the President, and Dr. H. Bunte, the General Secretary of the German Association of Gas and Water Engineers, a copy of the first volume of a work by Herr E. Grahn on the water supply of towns in the German Empire and adjacent countries. ["Die Städtische Wasserversorgung im Deutschen Reiche, sowie in Einigeu Nachbarländern," von E. Grahn. Erster Band. 547 pp. R. Oldenbourg, Munich and Leipsic.] The preparation of this valuable work of reference, under the auspices of the Association, has already been mentioned in the "JOURNAL" for July 26 (*ante*, p. 202). The present volume deals with Prussia, and gives details of the water supplies of 1244 towns in that country. We hope to refer to this important and careful compilation at greater length in some subsequent issue.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1244.)

THE Stock Exchange has had a smooth and peaceful week free from agitation of any kind. But still there is not the degree of activity in business which one would almost have a right to expect. The fact is that, when once the machinery of speculative operation has been stopped, it takes some time to get it into full swing again. Despite the comparative quiet, the markets all round have been firm; and prices in every departments show a nice rise, with a healthy tendency to improve further. The condition of the Money Market has aided the upward movement, unaffected by the rise in Berlin; and everything at present points to a continuance of the 4 per cent. rate to the end of the year, if nothing startling and disconcerting should occur. Business in the Gas Market has again ruled very quiet; and the tendency was inclined to be dull, though changes in quotation were few. In Gaslights, the "A" which had been hanging fire for some time gave way, and fell point by point until at the close it showed a loss of 4. This was largely due to the fact that next Tuesday at the Mart the Directors will offer for sale the large amount of £187,500 of stock. It must be borne in mind, however, that this stock will be on the new 4 per cent. basis, and is therefore the equivalent of £75,000 "A" stock on the present 10 per cent. standard. South Metropolitan was very little touched, and was rather inclined to droop for lack of support. In Commercials, a parcel of new and debenture stock marked at "special" low prices had a chilly appearance; but no business was done. The quotations will be "*ex* new" to-morrow. Next to nothing was done in the Suburban and Provincial group; and quotations did not move. At the Mart on Wednesday, £15,000 Brentford new stock was sold by the Directors; but the price realized was not very good. Among the Continentals, Imperial was the only one to show any animation; and it scored a fair improvement. European and Union were quiet, and unchanged. None of the remoter undertakings offered any feature calling for remark. The Water Companies were quite brisk, compared with the listlessness they had been showing for some time past; and the tendency was favourable enough to advance two or three quotations.

The daily operations were: All Gas stocks were very quiet on Monday, except Imperial Continental. Commercial debenture fell 1. Tuesday's business was a little more brisk; but quotations did not move. Wednesday was a quiet day, and inclined to droop. Gaslight "A" fell 1. In Water, Southwark ordinary rose 2; and East London 4½ per cent. debenture, 1½. Thursday brought no more activity into the market; and things remained listless. Gaslight "A" fell 2; but Imperial rose 1. In Water. Lambeth 7¾ per cent. advanced 2. Friday was a little more lively. Imperial rose 2; but Gaslight "A" fell 1. Saturday produced no further change.

ELECTRIC LIGHTING MEMORANDA.

Electrical Projects in Parliament—A South Lancashire Power Scheme—Mr. Raworth on the Electrical Industries.

THE parliamentary notices give promise of much activity in the two chief divisions of electrical engineering and industry—lighting and traction. The Board of Trade will be busy, mainly with local authorities' applications for Lighting Orders. It would be rash to hazard a guess as to the number of these destined to be carried out. It may at least be said with truth that there is no necessary practical connection between the proceedings of obtaining an Order and lighting a town, or there would not be 145 Provisional Orders in a state of suspense—that is to say, in the condition of being "hung up" indefinitely. Many projects of electric tramway and light railway working are on foot; and additions are threatened to the low-level electric railways of London. A typical example of the last-mentioned kind of electrical enterprise is put forward under the auspices of the Great Northern Railway Company, who wish to run a feeder line from Wood Green to the Strand. This is of a piece with the policy of the London and South-Western Railway Company in getting access from Waterloo to the City, with the improvement of not contributing to the congestion of the main line terminus, and the terminal section of the line. As Sir J. Wolff Barry showed the other day, something will have to be done to enable the great London passenger railways to grapple with their rapidly growing responsibilities; and these low-level electric relief lines may provide what is wanted, if only they can be worked at a reasonable cost.

Another big central electric power generating and distributing scheme is to be submitted to Parliament; the chosen field of operations being South Lancashire and Cheshire. The idea is to locate the central power station in the vicinity of St. Helens (where coal will be procurable at the door), whence current would be distributed to Liverpool, Widnes, Warrington, Wigan, and other populous manufacturing centres. The favoured places are to be connected by electric mains laid along the roads, so that any manufacturer or resident in their neighbourhood will be able to obtain all the electricity he may need for power, or

lighting, or chemical purposes. This supply is to be priced at 1d. or 1½d. a unit. The capital of the Company is to be a round million; and they would want every penny of it to carry out the ambitious programme which the promoters have carefully unfolded through the complaisancy of the Liverpool newspapers. The Company may consist, to begin with, as these reports claim, of "an influential group of manufacturers and capitalists;" but we think the smaller capitalists of the locality chosen for the scene of these operations will be well advised to have the whole scheme worked out to their satisfaction in detail before putting any money into it. The language of the preliminary advertisements is altogether too vague. Thus it is averred that "undertakings for the distribution of power, although comparatively novel in this country, are in common use on the Continent and in America"—where, and with what commercial results? The statement which follows—that "in consequence the foreign manufacturer has an advantage over his English rival, who is in practice compelled to produce his power for himself by means of isolated steam or other generating plant"—is clap-trap. The terms in which this project are recommended to the public do not command confidence.

When Mr. G. B. Raworth delivers an address upon matters electrical, he always manages to entertain and impress his audience. His latest performance in this line, for the benefit immediately of the Northern Society of Electrical Engineers, contains more information and suggestion in any half-dozen lines picked out at random than all the windy platitudes that recently reverberated by the hour in Great George Street. The first striking truth brought out by Mr. Raworth, was that the total amount of capital actively employed in electric lighting, by companies and corporations together, is £14,142,000. A handsome sum this, representing a great deal of honest work of brain and hand, and much devoted service. But in the years 1882 and 1883, when "the light of the future" was being "boomed," the total amount of money subscribed was £14,743,000. If the electricians of the period had only taken care of the money subscribed for them by the public in those two years, not a penny more would have been needed to carry out all the electric lighting work that has been done since. As a matter of fact and of history, most of this money vanished into the *ewigkeit*, without leaving a trace of its passage. Cash now laid out upon electric lighting mostly goes straight into the banking accounts of manufacturers of apparatus. Of every £100 so spent, the makers of plant get £37, and the cable makers get £34. The former stand before the world as representing electrical industry. "They make all the noise and hold all the meetings," said Mr. Raworth; but the cable men pocket all the profit there is in the business, without saying anything about it. Another suggestive remark was that, although 14 millions seems a good deal of money to have been sunk in electric lighting, it is a trifle compared with the investment in gas. Why, said Mr. Raworth, "we spend as much every year upon making the gas as the total subscribed capital of the electrical industry—14½ millions." There is plenty of space here for electricity to fill.

Mr. Raworth was equally candid on other points of electrical enterprise. He could not claim a large measure of success for the application of electricity to the propulsion of river or lake launches. There is something being done in this way; but there is "no money in it." Similarly with electric cabs. He wished he could say that these vehicles were going to be a great success. They seemed to answer very well as carriages; but how the accumulators were working, Mr. Raworth could not tell. He highly approves of the idea of generating and supplying electricity in bulk, while refraining from expressing an opinion on the feasibility of particular schemes. He hoped that electric traction and electric distribution of power, now being exploited by private enterprise, are not to be killed by municipal obstruction. With regard to foreign competition in the supply of plant, Mr. Raworth, as a British manufacturing engineer, is not afraid of it. The Americans, who are actually supplying a good deal of electrical machinery to this country, are not doing so at English prices; they are only filling orders that could not have been carried out here in the time. A piquant part of the address, referring to "the avarice of municipalities," is reserved for notice elsewhere, as it is a gas subject.

MECHANICAL TRAMWAY TRACTION.

Third Article.

The application of electricity to the driving of tramcars by the method of surface contact belongs to the category of those electric traction arrangements which alone have proved practically successful. This is the whole class of electric traction systems in which the motor car draws its driving power from a fixed line conductor conterminous with the rails. Mr. J. Allen Baker does not arrange his matter in the most natural and systematic way, or he would have divided electric traction into the two chief orders of "battery" and "line" systems. The "line" conductor is common to his divisions of traction by surface contact, by overhead wire with trolley, and by underground conduit.

These three classifications refer originally to the manner in which the electric power is to be delivered to the motor on the car, although obviously from these differences of connection spring many important divergencies of tramway construction. Fundamentally, all line systems of electric traction are alike as regards their main requirements. The most informing way of approaching the study of the subject is to start with a simple electric railway—like that, say, on Ryde Pier; and begin with an appreciation of the indispensable elements of the system. These are the motive power station, the line, and the driven car. When the elements of the system are grasped, it is comparatively easy to understand the nature of the minor modifications necessary to adapt the principle to various applications; street tramways being of the number. To begin, as Mr. Baker does, by describing "surface contact" electric tramways, before making it clear what the contact in question is to effect, is an exact electrical equivalent of "putting the cart before the horse." Actually, the concluding paragraph of his report, which lays stress upon the fact that "whether the current is carried by the overhead wire or the underground conductor in the conduit, the general installation (including power house, rolling stock, with motors and controllers, and the feeder cables) are the same," should have preceded all that he has to say concerning line systems. We shrewdly suspect Mr. Baker of not possessing a true engineering insight into the principles of his subject, because of his omitting all reference to the working data of electric railways, which are in the same category with tramways. A tramway differs from a railway only in having its working surface forming part of the common road; whereas in a railway the surface of the metals is the only road. With a railway, everything can be made subservient to the working of the line; with a tramway, the working must itself be subservient to the general use of the roadway by the public. Great as the consequential results of this difference are, they do not affect the fundamental problems of electric traction. We have in electricity a power which will drive railway carriages or tramcars. It can be very conveniently applied to the former class of traction by means of a line conductor, from which the travelling motor takes off the necessary power by sliding contact as it goes along. Any amount of power likely to be needed for this purpose can be generated at stations, and conveyed along the line. So far, there is no difficulty. There is no question here of "trolley" or any other device for making connection between the motor car and the conductor. There being no other interest to regard except the working requirements of the line and the traffic, we here find electric traction in the fairest possible field, where it can have everything it wants to do its work withal.

Why, then, are not all railways worked by electric power? Simply because, up to the present, it has not been established that the travelling electric motor can supplant the steam locomotive to advantage. A steam locomotive can take along an express train at a normal speed of 60 miles an hour, or it can haul goods trains running into hundreds of tons of dead-weight at a reasonable rate of speed for the size of the country and the needs of the traffic. It can do these things with an expenditure of (say) 200-horse power on the crank of the driving axle. Obviously, to do the same work an electric motor must exert at least the same power; but, actually, owing to the mechanical differences between the steam-engine with its long leverage on the crank, and the electric motor with a much smaller leverage, the latter must be supplied with considerably more power than suffices for the steam-engine. It follows that all this power, whatever its amount, must be taken off from the line conductor by means of the electric contact. No great learning in electric science is necessary to enable one to appreciate what this means, both for the conductor and for the contact-pieces. Electrical energy corresponding to perhaps 300-horse power has to be transmitted through a temporary connection of necessarily small area, making at best but imperfect contact between the operating metallic surfaces. We cannot state here conclusively how all these considerations work out. If we could, it would be because the matter is a part of common knowledge, which is so far from being the case that the Metropolitan Railway Company are spending a large sum of money, under the direction of the first engineering ability of the day, in order to find out the truth of it.

Short of this last application of electricity to traction, however, the Liverpool Electric Railway and the lines in London exist to show that light railways can be worked in this way. No evidence has yet been offered, from these examples, to prove that electric traction is of high efficiency, regarded from the standpoint of mechanical science. The electric traction has its advantages, and it may even be imperative of selection on their account; but it is very wasteful of power. Mr. Baker has not judged it necessary to inform his readers what fraction of the power generated and sent into the line conductors in Liverpool, South London, and at Waterloo is accounted for in the haulage. We fancy that if this ratio were known, there would be an end of the talk about the "economy" of electric traction. At the same time, one must distinguish between mechanical economy and commercial cheapness. The latter may exist in the absence of the former; and in the particular case in point, coal may be cheaper than horseflesh for tramway working. Perhaps it is. The next thing to be considered is how the power of coal, through the intermediary of electricity, can best be used for the supersession of horse haulage.

Passing on from the considerations of how much power we want for the purpose, and what it costs to provide, the most pressing special advantages and drawbacks of electric tramway

traction are very soon stated—although not so easily adjudicated upon. Not to treat the question as one of comparison, but on the merits, it appears that electric traction is cheap, swift, cleanly, able to deal with heavy traffic, and both safe and comfortable in use. The most salient drawback is that an electric tramcar is not self-contained, but depends for its power of locomotion upon the line conductor. Everything connected with the general question of the improvement of tramway working starts from one of these considerations. The moment they are valued, the comparison between possible systems starts afresh.

Granting all that can be claimed for electric traction in itself—its speed, cleanliness, silence, and large capacity for work—how is it to be applied to tramcars, which are at best statutory trespassers on the Queen's highway? The naked parallel conductor of the electric railway is out of the question. It has been proposed to get over the difficulty by converting the continuous conductor into an interrupted one, having contact-pieces sticking up in the line of tramway, from which the car can derive motive power as it passes over them; while no other vehicle or wayfarer would be able to effect the same kind of connection. This is Mr. Baker's "surface contact" system. His report very briefly describes several experimental tramways worked in this way, in Paris, Monaco, and Washington. The Birmingham Corporation Committee recognized as the special recommendations of such a system the absence of overhead wires, of open slots in the surface of the street, of tubes, and of deep excavations—all the necessary work being contained within the thickness occupied by the concrete foundations of an ordinary paved street. Mud and water, to a depth obscuring the contact-plates, do not affect the working. The return current is conveyed by the rails, which would therefore have to be relaid and bonded as for every other electrical system. Mr. Baker does not mention the work of Westinghouse in this kind. The fact of so able a mechanic as George Westinghouse having chosen this field of enterprise to work in, shows its attractiveness; while the circumstance of his having laboured in vain goes far to prove its hopelessness.

Yet it seems that Mr. Baker has no more been allowed to say the last word about the surface-contact system of electric tramway working, than about the gas-tram. According to the "Electrician," there is a closed-conduit system of tramway working, the invention of Mr. Christopher Anderson, now being tried upon a short length of experimental line at Leeds. In this arrangement, the surface contact-pieces are not fixed, but are capable of being pushed up 4 inches from the road surface level, at which they ordinarily rest. When raised, the pieces are electrically alive; when dropped, they are inert. It is obviously of the first importance that there should be no mistake about the operation of these members of the system; and this is the point that time and experience can alone dispose of. Another arrangement of the same kind is being tried at Willesden—known as the Thompson-Walker system, which has been warmly advocated by Professor Silvanus Thompson (one of the inventors), and was described in a British Association paper. Mr. Baker does not appear to know anything about this experiment, which our electrical contemporaries do not think very highly of up to the present. Further trial in the actual roadway is needed to establish the reliability of this or any other surface-contact system, under the rough and arduous conditions of London street traffic. No mere makeshifts are worth an instant's consideration in this connection.

This reflection brings us to the question of the "trolley-wire" system of electric traction. This is, emphatically, the test question of the hour for the tramway and electrical engineering interests. It should be understood, to begin with, that the trolley and the overhead wire are merely a device for enabling an electric motor tramcar to obtain its power as it goes along. This is elementary information; but from the tone of much that is published by the technical Press respecting this subject, and of more that is reported as proceeding from local authorities, it seems that some misapprehension exists as to the nature and scope of the so-called trolley-wire system. Our electrical contemporaries, for example, often appear to be anxious to ram the trolley-wire system down the throats of the British public, regardless of the protests of those who object that the streets of English towns are worthy of better treatment. Over and over again the public are told that what is good enough for 30,000 miles of American thoroughfares, ought to be good enough for London; but this is not the way to put it. We doubt if our electrical friends themselves admit the force of the argument. They advocate the system because it is the cheapest; but it is Mr. Baker's greatest merit that he has shown how little regard need be had to this plea. London, at any rate, does not want the cheapest system, but the best. The electricians, almost to a man, have kept out of sight the consideration upon which Mr. Baker lays most stress—that the trolley-wire system is but a cheaper way of carrying the current, and conveying it to the car, as compared with the underground conduit system. Everything else is the same for both systems—generating stations, cars, motors, rails, bonding, electrolysis risks, and the rest of it. Nobody questions the unsightliness of the overhead wires, nor denies that they obstruct the thoroughfares. In the case of curves, they are troublesome; at busy crossings, they are a terror. Can anyone who knows Tramway London imagine the Elephant and Castle delivered over to this system? Such is, in brief, the controlling factor of the situation. When London is equipped with a system of mechanical tramways, no makeshift device will serve the turn. The population per mile of tramway in London is (according to Mr. Baker) 31,786. A long way after comes Paris, with 21,739 people per mile; followed by Glasgow, 20,064; and so on, down to Chicago and Philadelphia, with little over 4000 per mile. To talk of cheap tramway construction as though it were a consideration affecting London as it might affect "Bridgeport, Conn.," is nonsense. Whatever system of electric tramway working is tried in London, the existing tracks will have to be relaid; and after this necessity is realized, the question of whether the conducting wire should be carried overhead or placed in a trough between the metals loses its importance. When, further, the small saving of the former system is weighed against its unsightliness, danger, the nuisance of sparking, and the obstruction of the thoroughfare, it "kicks the beam." As Mr. Benn, the Chairman of the Tramways Committee of the London County Council, has aptly observed, people in London think trams are an eyesore at best; and if it were to become understood that the trolley wire must go with the tram, there would be the greatest possible opposition to the further extension of the lines in districts where additional transit facilities are really needed. If the price of deliverance from the trolley wire is a matter of a little money, or even of a good deal of money, London will sooner pay than suffer.

SECOND EDITION OF BUTTERFIELD ON "GAS MANUFACTURE."*

It seems only the other day that we had the pleasure of introducing to "Journal" readers the first important effort in the technology of gas manufacture of a young master of the chemical side of the subject, Mr. W. J. A. Butterfield, who was then in charge of the Beckton laboratories. Our files remind us, however, that this happened within a month of three years ago. On reperusing our *critique* of the first edition of Butterfield's "Gas Manufacture," it appears that a generally appreciatory judgment of the work was qualified in certain regards; and the hope was expressed that what we considered to be defects would be made good in a future edition. Now that in fulness of time a second edition, revised and added to by the author, has been published, it becomes our duty to inquire how far the excellent promise of the first has been fulfilled.

Painful experience of the ways of publishers has taught book buyers to make sure, when a so-called new edition of a well-known work of reference is offered for sale, that it is really freshened up. We shall never recommend readers of the "Journal" to look twice at a mere publisher's "new edition." On the other hand, when it has been given to a capable author to produce a good handbook of any art or industry which is inspired with life and the power of development, it becomes his bounden duty to keep his work up to date. Fresh and new as Butterfield was three years ago, a good deal has happened in the gas industry since then. Students and followers of a manufacture so very much alive as that of illuminating gas want to buy text-books that tell what gas making actually is, not what it was even three years back.

Mr. Butterfield's first book was not quite authoritative on the mechanical side of the industry, which was not to be wondered at, seeing that the author is a chemist. We had to criticize his treatment, as a chemist, of certain points of gas manufacturing practice which, though mechanical in character, require to be judged by their results. It is with the results of manufacturing processes that the chemist has to do. He is, or should be, the professional critic of the engineer and mechanician. It is worse than useless for an engineer to construct plant which, however excellent from the mechanical point of view, does not yield the right kind of results in gas or residuals. Mr. Butterfield is still too diffident, or remiss, in grappling with such chemical problems as the influence of the dimensions and shape of retorts on the character of the gas produced, and the cause of stopped ascension-pipes. In these respects, the author has not always corrected himself; but the paragraphs relating to the inclined retort system of carbonizing have been extended and almost wholly rewritten. Even so, Mr. Butterfield has not succeeded in reconciling all opinions concerning carbonizing methods. The paragraph on "Carbonization-Products" is improved.

Mr. Butterfield has added another head to his systematic classification of the raw materials of gas manufacture, in order to make a place for those new comers, the carbides, "which interact with water to yield gaseous hydrocarbons." His discussion of the impurities of crude coal gas has been recast in order to lay stress on the pernicious effect of carbonic acid upon illuminating power. He makes the observation that "generally speaking, the removal of carbonic acid is less costly than enrichment to compensate for its retention in the gas." As the French say, "that depends." It is not always a question of simple cost, but of expediency and convenience as well. The account of washing and scrubbing has been modernized; and a new paragraph treats of "traces of ammonia in washed gas." It is unnecessary to say anything to commend Mr. Butterfield's masterly

* "Gas Manufacture (The Chemistry of)," &c. Second Edition, Revised, with a New Chapter on Acetylene. Numerous Illustrations. By W. J. Atkinson Butterfield, M.A., Consulting Chemist, Formerly Chemist at the Gas-Works, Beckton. London: Charles Griffin and Co., Ltd.; 1898.

handling of all questions of testing. A new paragraph deals prudently with the toxic action of water gas. Those who want information concerning oil gas and spirit enrichment processes, will find it here. The author's treatment of acetylene is adequate; and his observations upon its use for lighting, judicious. Lastly, an appendix contains the London Gas Referees' instructions for the summer of the present year. Altogether, therefore, we are able to recommend the new edition of "Gas Manufacture" as well deserving a place in every gas engineering library, however limited.

PERSONAL.

On Monday last week, the officers of the Portsea Island Gas Company invited to a complimentary dinner their colleague Mr. HARRY BARBER, who, after 21 years' service, is leaving the Company (as already mentioned in the "JOURNAL") to take the appointment of Secretary of the Sheppy Gas Company. A handsome testimonial, which took the form of a silver tea and coffee service, was subscribed for by the Directors and officers of the Company, and was presented by the Secretary, Mr. C. Jenkins, who bore testimony to Mr. Barber's great abilities, and to the efficient manner in which he had always carried out the duties of his office.

OBITUARY.

Mr. JOSEPH WHITWORTH, who for many years has been Secretary of the Honley Gas Company, died last Sunday week, at the age of 77.

We regret to record the death, on the 20th inst., of Mr. ROBERT DALE, who had been for a quarter of a century connected with the Durham Gas Company, and for the past seventeen or eighteen years had held the position of Secretary. He had been in very bad health for some little time; and during the summer the Directors sent him to Grange-over-Sands. He returned rather better, but was not long able to attend to his duties. He was a member of the North of England Gas Managers' Association, but was very little known. Mr. Dale was only forty years of age, and unmarried.

NOTES.

Preservative Paints.

Some instructive tests of preservative paints are reported in American technical journals as having been carried out for the Norfolk and Western Railway, under the supervision of Mr. G. R. Henderson. There were 162 test-pieces in all, of different materials; but they all had two coats of paint on one side in nine different combinations of lead and zinc. Thus treated, the samples were hung for a year on the south side of a workshop, just under the eaves. With tin, the best results were obtained with a first coat of white lead and a second coat of white zinc. It was the same with galvanized iron. With sheet iron, the mixture of one-third white zinc and two-thirds white lead, for both coats, gave the best results. Poplar and white pine wood did well with a second coat of zinc upon a priming of lead, or zinc, or of both mixed. Yellow pine seemed difficult to treat properly with any blend of paints; but a lead priming answered best. As a general result, it appeared that lead priming and zinc coating is good for tin, galvanized iron, poplar, and white pine. Sheet iron showed up best with both coats of mixed paints. Black iron, as might be supposed, took the paint better than either tinned or galvanized plate. The suggestion that lead and zinc paints can be mixed with advantage for structural ironwork is novel, and cannot be accepted without some fuller experience.

The Strength of the Ironmongers' Trade.

A suggestive "census" has just been taken by the "Ironmonger" to ascertain the six articles most frequently asked for by ironmongers' customers. It is stated that the number of responses to the inquiry has been sufficiently large to enable an opinion to be formed as to what articles are chiefly in demand, throughout the United Kingdom, of this class of shopkeepers. The inquiry is obviously one that might be extended with advantage to other dealers in "sundries," and would help to establish the truth as to what the public chiefly needs. In the case of the ironmongers, the commodities that figure in the greatest number of entries are as follows, in the proper order: Nails, screws, tacks, locks, paraffin oil, lamp glasses. The attention of readers of the "JOURNAL" may be directed to the two last items of the list. All over the kingdom, the mineral oil lamp and the chimneys which it is continually requiring, provide the ironmonger with a great proportion of his trade. Our contemporary does not notice the fact that in London the commerce of the oil lamp is so important that a distinct description of shop is devoted to it. Where the oil shop does not exist, the ironmonger takes the trade. It appears that 68 leading articles altogether were listed as furnishing the bulk of the ironmonger's over-the-counter trade, whereof oil and lamp-glasses came fifth and sixth respectively. Nearly all the returns mentioned these commodities; some giving them the first and second places. A long way after came lamp wicks, lamps, and incandescent gas-burner mantles. There is evidently plenty of lost ground for the prepayment gas-meter to overtake. No other gas-burner besides the incandescent is in the running.

Gas and Water Mains and Electrolysis.

At the convention of the American Society of Municipal Improvements, recently held in the city of Washington, Mr. L. W. Rundlett, City Engineer of St. Paul, presented a report from a Committee appointed last year to investigate the subject of protective coatings for cast-iron and steel riveted gas and water mains. There was little fresh matter in the report. The experience of the past year in St. Paul with cast-iron pipe coated with coal tar, and steel pipe with the Sabin baked covering, showed that the former exhibited slight tubercles, while the coating of the steel main was intact. Mr. Rundlett laid stress upon the importance of careful inspection, to see that the pipes are thoroughly cleaned and properly coated; remarking that rigid specifications not backed up by equally rigid inspection are unfair to contractors and of little protection to cities. At the same meeting, a report of a Committee on Electrolysis was brought up by Mr. Harold P. Brown, who, apparently in despair of getting the mischief prevented in any other way, suggested that gas and water service pipes might be made of wood covered with spiral wrought-iron bands, and heavily asphalted. It was also proposed that, where the danger of electrolysis is greatest, two or more consecutive lengths of wooden gas and water mains should be interposed, in order to break the electric conductivity of the distributing systems. Lead caulkings of existing mains in danger areas should also be carefully painted over with asphalte or petroleum wax. Other speakers confirmed the statements made as to the gravity of the evil and the difficulty of preventing it. At Milwaukee, the water-mains are actually connected to the dynamos of the power stations by means of heavy conductors.

Stray Electric Currents in New York.

At a recent meeting of the American Institute of Electrical Engineers, in New York, Mr. A. A. Knudson read a paper on the results of an electrical survey of the Manhattan Island, conducted with the object of discovering and measuring wandering electric currents. This locality has elevated railways and trolley-wire electric tramways. About a year ago, the trolley line had a terminus on the east side of the island, immediately fronting an elevated railway station. At this point, there was a difference in potential of 2 volts, rising at times to 10 volts, between the tram-rails and the nearest gas-main. After the removal of this terminal, Mr. Knudson had an opportunity for observing the effects of the passage of electricity from the tram-rails to the gas-pipes and structure of the elevated railway. Here the damage appears to have been confined to the rails. When new, the bottom of the rail was 4 inches wide; but when taken up, the width of the end rail was only $2\frac{3}{4}$ inches, and the lower edges were all worn away to extreme thinness for many feet. Moreover, the rail ties had been eaten through in the middle. Tests at another point showed that a trolley line using rails and water-mains for its return service, can spread its influence for a mile or more in any direction—affecting even independent metallic structures. Thus the superstructure of the New York end of the Brooklyn Bridge was found to be as much as 3 volts positive to the rails of the adjoining cable tramway. The existence of these stray currents, naturally led to a consideration of their effect on the bridge, particularly on the anchorages. No evidence of damage in this respect was discovered.

Coke Filters for Feed-Water.

It is a commonplace of industrial experience to state that, while great developments and valuable improvements are continually in progress in some machines and processes, there are many apparently simple requirements which never seem to approach any nearer to complete fulfilment. Stopped ascension-pipes, and naphthalene deposits are illustrations of these incurable complaints in the department of gas manufacture. Mechanical engineering knows several such; prominent among them being the difficulty of removing grease from boiler feed-water. This is admittedly one of the most important of all the technical subjects that engage the attention and exercise the judgment of the mechanical engineer. Marine engineers have long been familiar with this difficulty; but now that large steam-power plants for electric lighting and traction purposes are becoming increasingly common in towns, the question of economizing the feed-water by returning the condensed water to the boilers, is assuming more general interest. The most obvious means of getting the grease out of the condensed water is by filtration; and this is effected by the use of straw, sponges, cloths, and sand. It is suggested, however, that gas coke makes the best filtering medium, and possesses the additional recommendation of costing nothing for the purpose, because it can be burnt to advantage under the boilers when too foul for further use in the filter. Every other filtering medium requires either cleaning, which is a filthy job, or carting away, which costs money. Even coke, however, will not arrest more than 90 per cent. of the grease in the water; and the remainder is still too much to go into the boilers. Further experiment, to deter-

mine the best conditions of duty of coke for this purpose—the proper size of the pieces, and so forth—would be highly valued.

"Etherion" Exploded.

Sir William Crookes handles somewhat severely the claims of Mr. Charles F. Brush to have discovered a new atmospheric gas, which he has called "etherion." The discoverer has not pretended that his find possesses any chemical affinities, and admits that he only stumbled upon it by observing that in the course of some high vacuum experiments something came off which exhibited a remarkable power of conducting heat. Sir W. Crookes was moved by this statement to look up his notes of old researches upon similar lines; and he now publishes in the "Chemical News" the evidence which tends, in his opinion, to show that Mr. Brush's etherion is nothing more than aqueous vapour. It is hardly necessary to remark that Sir W. Crookes has been working at vacuum experiments for upwards of a quarter of a century; and so long ago as 1873, he noticed that the presence of a little aqueous vapour played peculiar pranks with some of the results. In short, the anomalous action of aqueous vapour has been obtruding itself upon the notice of the inventor of the radiometer since this early period; and although much of his research into this matter has never been published, he finds in it ample ground for the suspicion that the new American atmospheric gas will turn out to be nothing more mysterious than water vapour. It is admitted that only an abstract of Mr. Brush's paper has yet been published; and Sir W. Crookes politely affects incredulity that so serious a matter as the existence of a new element should be proposed to be inferred from the scanty evidence yet offered. As it is, one of the strongest pieces of evidence offered by Mr. Brush—the occlusion of his new gas by broken glass—strikes his critic as one reason for regarding it as nothing but water. With regard to the conduction of heat, the rarefied aqueous vapour, somewhat misleadingly called "water gas" by Sir W. Crookes is a better conductor of heat than air or hydrogen at like pressures.

COMMUNICATED ARTICLE.

SLOT COOKERS AND ALL ABOUT THEM.

By E. W. T. Richmond.

THIRD ARTICLE.

"Toward London, back again,
To look into this business thoroughly.'
"Henry VI.," Part II., Act ii., Sc. 1.

1897.

Our first public reference this year is again by Colonel Makins, who, in common with Mr. George Livesey in 1895, now places his remarks respecting gas-stoves and automatic meters right in the forefront of his half-yearly February address to the Chartered Company's shareholders. Well may he do so, seeing that in 1896 the consumption had increased over 1894—the year before the introduction of the automatic system—1874 million cubic feet. This increase was equal to the whole make of Bradford (1669 millions), Nottingham (1673 millions), Edinburgh (1554 millions), or Brighton and Hull (1800 millions)—a result due almost entirely to the 33,506 additional ordinary stoves (or 39·8 per cent. 1896 increase over 1895) and the 75,000 automatic supplies, 66,300 of which had cookers. The amount consumed by automatic cookers alone is referred to later in this article. He said the average automatic consumption was 19,000 to 20,000 cubic feet, which was more than they dared to expect.

Chartered Company's Consumption Increases 1874 Million Cubic Feet.

London Average Prepayment Consumption, 19,000 to 20,000 Cubic Feet.

When these figures are considered along with those given the following week by Mr. Livesey to his shareholders, it becomes increasingly evident that no Gas Department can afford to wait longer before carefully considering the London free cooker system. Mr. Livesey describes the increase of 1896 over 1895 in money value at £43,000, and he divides this increase into three parts—one, and the largest, to automatic supplies with cookers; and the other two to "gas-stoves and new consumers." So that, taking the gas-stoves to ordinary consumers and the cookers supplied to automatic meters, the writer ventures to credit gas-stoves with an increase for this one year of over £20,000 to the South Metropolitan Company alone.

South Metropolitan Receives £20,000 Extra Stove Revenues.

"I should be glad to hear such news as this once every hour."
"Henry VIII.," Act iii., Sc. 2.

Mr. J. Young, of Hanley, in his characteristic "commercial" address from the chair of the Midland Association in the same month as the last two speeches referred to were delivered, again refers to the automatic supply, and admits with a refreshing candour that in Hanley the supply of meters only, without fittings and cookers, has not increased much after the first spurt of 1000 was supplied, as in two years he has only added another 500. He says "they may have been too cautious;" and, in view of the success attending the supply of stoves and fittings elsewhere, he is seriously considering the desirability of increasing his automatic "inducements."

Mr. J. Young, Hanley, (Now of Norwich.) "Too Cautious."

The Eastern Counties Association has frequently, and during its last meetings invariably, had some useful reference made to the automatic system; and Mr. J. T. Jolliffe in his Peterborough address (April, 1897), packed as it was with facts and figures, reserved a first-class compartment for prepayment meters. In five years, through their agency, he has nearly doubled his consumers, bringing them from one consumer to twenty inhabitants to one in ten. He supplies four brackets with governor burners (more, if desired, at the consumer's cost) and a good-sized cooking-stove at 1s. per quarter; and as regards capital, the meter only is placed to this account—the 7d. extra per 1000 cubic feet is credited to a suspense account which liquidates the cost of the remainder of the installation.

How Mr. J. T. Jolliffe Finances.

	Cubic Feet.	Revenue.
Ipswich average lighting consumption . .	12,700 ..	£2 2 6
" " cooker consumption . .	7,300 ..	1 4 3
Total automatic consumption . .	20,000 ..	£3 6 9

The Great Eastern Railway conveys us direct to our next meeting, that of the Commercial Gas Company, where the Chairman, Mr. J. Blacket Gill, congratulates the shareholders and the Engineer (Mr. H. E. Jones) on a record increase for their Company of 7 per cent. for the year ending 1896. And here again it is automatic supplies and gas-stoves to ordinary consumers which account chiefly for the increase. Mr. Jones, in responding to the usual vote of thanks, gives an interesting glimpse of East London in the years that have fled, and shows why the Company's consumption does not increase faster. This Company fixes slot cookers free separately, and where fixed along with fittings a nominal charge of 1d. per quarter only is made.

Mr. H. E. Jones, M.Inst.C.E., Commercial Gas Company.

The public interest in the system is also manifested by the remarks of the Chancellor of the Exchequer (Sir Michael Hicks Beach). In the Budget speech during the following month (May), he stated that for the year ending March 31, 1897, more than three times the usual number of bronze coins had been minted—largely due to the increasing use of penny-in-the-slot mechanisms. Taking it that at this time there were 300,000 automatic meters in use in the United Kingdom—a number well within the mark—averaging (say 11,500 cubic feet per annum at 25 feet for 1d., or 3s. 4d. per 1000 cubic feet, this would represent 140,000,000 pennies dropped into the slot; and allowing for those used over again, we still have here a tangible effect on the coinage of the country through a simple departure in the system of collecting gas-rentals. The Chartered Company alone collect over 1,000,000 pennies a week—equal to about £215,000 per annum; and in Manchester 43,000 have been collected in one day.

Sir Michael Hicks Beach and the Coinage.

This historical sketch now brings us to another Presidential Address this year—Mr. C. S. Ellery's at Bath, in June—in which distinctly favourable views both of the present and future of the system are expressed. Mr. Ellery belongs to the enterprising band who early recognized the desirability of supplying slot cookers; and, though charging a rental, he has supplied a moderate proportion of his meters with cookers.

Mr. C. S. Ellery, Bath.

Simultaneously, the fascination of the automatic meter spreads itself over the Paris meeting of the Société Technique de l'Industrie du Gaz en France. Descriptions of four various automatic meters and allied contrivances were read by their respective inventors. The only one that calls for special notice is M. de Billy's, consisting of two separate meters in one case—one for day, the other for night consumption, at, of course, differential prices.

Continental Progress and Opinions.

Within three months of the Paris meeting appears a most exhaustive report on automatic meters throughout Europe, compiled by Herr F. Reichard, of Carlsruhe. The writer remembers visiting this gentleman twelve years ago, and found him most enterprising, and free from Continental prejudices. As might be expected, in his own town light and cookers are supplied at 1s. per quarter. The refusal of the German Standards Authorities to recognize the slot meters has prevented much progress being made up to date in Germany; but now this is withdrawn, a great future is before them.

Herr F. Reichard, Carlsruhe.

In France, an installation with a cooker, two lights, and meter, averaging about £4 10s., including service, is the usual practice. In Italy, Rome and Genoa have upwards of 1000 meters in use. In Switzerland, Geneva alone has successfully introduced the system.

France, Italy, and Switzerland.

In Denmark, Copenhagen had at this date 250 meters. There is little doubt, however, that Mr. F. D. Marshall, who boasts at present a day consumption of nearly 80 per cent., will make the system, both in Copenhagen and the other ten Continental towns under his brilliant and resourceful management, an unqualified success. Unfortunately, an account of the method whereby Mr. Marshall obtained his unique and remarkable day

Mr. F. D. Marshall, Copenhagen.

consumption does not come within the scope of this article; but it may be stated that, chiefly through this consumption, he has in seventeen years reduced the price of gas in Copenhagen and the other towns lighted by his Company, from about 7s. 6d. to 3s. 3d. per 1000 cubic feet, besides paying 9 per cent. on an additional capital of close upon £500,000.

HOLLAND AND BELGIUM.

In Belgium, Antwerp, with more than 3600 prepayment meters, and Brussels, with 1100, are fair beginnings. Three other towns average more than 200 each. In Holland, Utrecht, Rotterdam, Tilburg, Hoorns, and Arnhem have upwards of 10,000 meters between them, and are fixing over 150 aweek.

Herr W. von Oechelhaeuser, of Dessau, considers "the delay in pushing the meters in Germany is a good thing, as they will profit by recent English improvements!" The custom of having two coin boxes to each meter finds favour in the Fatherland, one being removed full while a second is replaced empty—a system open to various objections, but worth passing notice.

MR. THOS. WILSON, COATBRIDGE.

Returning to our own shores, we are again favoured by a paper on "Prepayment Meters," read at the annual meeting of the North British Association by Mr. Thos. Wilson, of Coatbridge. Neither in the paper nor in the discussion which followed do we find any mention of cookers being supplied. But this feature will not long escape the attention of our Scottish friends when they realize, as Mr. Hubert Pooley, of Dunfermline, among others, has done, that cookers are a necessary adjunct to make the installation really pay. Mr. Wilson's plan of "returning the difference" after a reduction, instead of changing the wheels or otherwise adjusting the meters, seems popular—gratifying a general weakness for discounts; and he has increased his consumers 22 per cent. by prepayment means.

Mr. T. D. Hall, of Montrose, recommends shilling-in-the-slot

HOUSES SUPPLIED WITH SLOT COOKERS BY THE TONBRIDGE GAS COMPANY.

NUMBER OF SLOT COOKERS FIXED BY THE COMPANY, 260.

BETTER-CLASS HOUSES, ASHBURNHAM ROAD, TONBRIDGE.

Rentals per week	9s.
Number of cubic feet of gas for 1d.	23
Extra charge per 1000 cubic feet to prepayment consumers	9d.

CHEAPER-CLASS HOUSES, BOTANY, TONBRIDGE.

Rentals per week . . . . . 3s. to 3s. 6d.

[Tonbridge average automatic consumption, 13,000 cubic feet = 8000 feet, "cooker;" 5000 feet, "lighting."]

HOUSES FITTED WITH SLOT COOKERS BY THE IPSWICH GAS COMPANY.

NUMBER OF SLOT COOKERS FIXED BY THE COMPANY, 454.

BETTER-CLASS HOUSES, WESTERFIELD ROAD, IPSWICH.

Rentals average per week	10s.
Number of cubic feet of gas for 1d.	24
Extra charge per 1000 cubic feet to prepayment consumers	7d.

CHEAPER-CLASS HOUSES, GREAT GIPPING STREET, IPSWICH.

Rentals average per week . . . . . 2s.

meters; and Mr. A. Yuill, of Alloa, after three years' experience, heartily approves of the system, as also does Mr. A. Wilson, of Perth, with 800 prepayment meters in use. Mr. David Vass complains of having only 3000 to 4000 cubic feet consumption per annum through these meters in Portobello. If he had cookers fixed he would soon cease to complain, and rejoice in at least a trebled consumption. At any rate, this is evidently the

COAL CONSUMPTION CHECKED.

view of the National Association of Colliery Managers, who met in May, 1897, at Wrexham, and whose President complains that "the coal strikes are causing the public to use gas-stoves," and that they are "encouraged to do this by gas companies supplying and fixing free of cost gas-stoves in their respective districts." Rather an alarmist view, considering that water and oil gas are as yet but trifling adjuncts to the gas obtained from our coal supplies. Still, the pronouncement "marks time," and shows how gas cooking and heating are laying firm and favourable hold of the public mind. A thousand pities not to strike while the iron is hot, and weld, by means of the automatic attachment, this great mass of new consumers into a united community of gas-stove users.

No two Gas Engineers have done more to bring about this

MESSRS. G. & F. LIVESEY, IN "DAILY NEWS" AND "DAILY MAIL."

desirable result than Mr. George and Mr. Frank Livesey; and we find this duly appreciated by the London Press. The "Daily News" published an interview about this time (August, 1897), with Mr. George Livesey, who added to his prepayment paragraphs advice as to the use of incandescent burners. This was followed shortly by the enterprising "Daily Mail," who received from Mr. Frank Livesey most interesting facts and figures, from which I select the following bearing on the subject: "Prior to the introduction of the coin meter (with cooker), Sunday was an

HOUSES FITTED WITH SLOT COOKERS BY THE WALLASEY GAS DEPARTMENT.

NUMBER OF SLOT COOKERS FIXED BY THE DEPARTMENT, 200.

BETTER-CLASS HOUSES, WINDSOR STREET, NEW BRIGHTON.

Rentals average per week . . . . . 9s.
Number of cubic feet of gas for 1d. 23
Extra charge per 1000 cubic feet to prepayment consumers . 7½d.

CHEAPER-CLASS HOUSES, HOPE STREET, WALLASEY.

Rentals average per week . . . . . 6s. 2d.

extremely slack day for gas, but the demand between twelve and two o'clock, when thousands of dinners are being cooked on and in the gas-stoves, is enormous. . . . The effect has been an equalizing of the summer and winter consumption. Formerly there was a great disparity; but the consumption of gas for cooking in the summer months has worked a marked change." Again: "Not more than a dozen of our coin meter consumers have been lost!"—a striking testimony to the popularity of the system. Mr. Livesey stated that as much as 10 tons of coppers had been removed in one collection, and it was estimated that at one time £10,000 worth of coppers was locked up in their slot consumers' meters. Mr. Frank Livesey writes me, in the course of an appreciative letter, under date Oct. 29, 1898: "If I were asked to add to your articles, I should say, when you have a considerable number of these consumers, see that there is a good pressure in the mains, *for if you give them the gas they will burn it.* I now put on a special cooking pressure daily between 11 a.m. and 2 p.m."

THE SOUTH METROPOLITAN COMPANY GETS 63,000 NEW CONSUMERS.

The remarkable hold obtained by the South Metropolitan Company on its district may be gathered from Mr. G. Livesey's bi-annual address. He stated that at this time they had secured *two-thirds* (63,000) of their possible consumers, and were gaining on the other third (37,000) at the rate of 200 a week. To find a parallel to their present consumption increase of 10 per cent., it is necessary to go back twenty-five years.

THE GASLIGHT AND COKE COMPANY GETS 65,000 NEW COOKER CONSUMERS.

The Gaslight and Coke Company share in this prosperity, as is evinced by the Governor's remarks at the August half-yearly meeting, in the course of which he speaks of their 65,000 automatic cookers consuming in 1897 508 million cubic feet of gas—an amount as large as the whole make of Derby or South Shields, or the three towns of Lancaster, Ramsgate, and Stafford combined. The total automatic lighting and cooking consumption is referred to at the commencement of this article.

The fast passing months bring us again into October, and the date of the North of England Gas Managers' Association meeting, under the presidency of Mr. J. Holliday, to whose experience with prepayment meters and grillers previous reference has been made. In his address, Mr. Holliday expresses every confidence in the future of the slot system, but is "dubious" as to its increasing at the rapid rate which ruled at the commencement of the system; and he is, I know, not satisfied with the amount of the automatic consumption. The writer is arrested by this and similar statements made by gas engineers where a cooker is not supplied. It would appear that the addition of slot cookers increases the demand for slot meters wherever adopted. As mentioned in the second article, Mr. Holliday writes me (Oct. 18, 1898): "The Scarborough Gas Company have agreed to supply a slot cooker free;" so that their demand for slot installations may be expected to boom again.

MR. J. HOLLIDAY, SCARBOROUGH, "DISSATISFIED."

HOUSES FITTED WITH SLOT COOKERS BY THE HEREFORD GAS DEPARTMENT.

NUMBER OF SLOT COOKERS FIXED BY GAS DEPARTMENT, 366.

BETTER-CLASS HOUSES, CHANDOS STREET, HEREFORD.

Rentals per annum £18
Number of cubic feet of gas for 1d. 20
Extra charge per 1000 cubic feet to prepayment consumers . 14d.

CHEAPER-CLASS HOUSES, BRYNGWYN TERRACE, HEREFORD.

Rentals per annum . . . . . £7 10s.

While in the neighbourhood of Scarborough, reference should be made to the success attending the introduction of automatic installations with cookers in Hull. I cannot find any public references from Mr. Dougall, but it should, I think, be known that his automatic consumption,| with cookers, ranges from 19,500 to 22,000 cubic feet per annum. These excellent results are doubtless attributable to the British Gaslight Company's liberality in supplying 35 cubic feet of gas for 1d., and the cooker to help out the day and summer consumption.

MR. A. DOUGALL, HULL.

This record of the public references to prepayment meters in 1897 would be by no means complete without recording the outspoken testimony of the Commercial Gas Company's respected and resourceful Engineer, Mr. H. E. Jones, to the advantages of attaching a cooker to the automatic installation. The Company had a record increase of 11 per cent.—1 per cent. better than the South Metropolitan; and, in response to a vote of thanks moved by the Chairman (Mr. J. B. Gill) and seconded by Mr. George Livesey, Mr. Jones said "the 11 per cent. increase could not continue, but there was room for a steady growth by supplying gas to working men's dwellings. They were not only helping the working man, but the working woman too, as when the latter persuaded her husband to put in a small gas-stove, the consumption went up more than 50 per cent." Mr. Frank Livesey gives the South Metropolitan Gas Company's cooker increase at 70 per cent.; and Mr. G. F. L. Foulger, The Gaslight and Coke Company's, at 100 per cent. The foregoing testimony from so cautious a "parliamentary hand" as Mr. Jones is most valuable. Had he desired to quote, he might have added—

COMMERCIAL GAS COMPANY INCREASE 11 PER CENT.

> "Mistress, I beseech you,
> Confirm his welcome with some special favour.
> * * * *
> Once more, new servant, welcome."
>
> "Two Gentlemen of Verona," Act II, Sc. 4.

* * * * * *

With such an admitted increase, free cookers must surely soon become throughout the country a recognized part of every installation. Let us hope slot consumers may speedily be told that cookers—

> "Shall ere long be free,
> * * *
> Be free, and fare thou well."
>
> "Tempest," Act v., Sc. 1.

(*Will be concluded next week.*)

Society of Engineers.—At the meeting of this Society next Monday, Mr. George Thudichum, F.C.S., will read a paper on "Bacterial Treatment of Sewage."

Railway Carriage Lighting by the Pintsch System.—For some time past there have been general complaints with regard to the lighting of the trains on the South Australian Railways, and various attempts have been made to introduce some better system of illumination than the oil-lamps which afflicted passengers by the long-distance trains running out of Adelaide. Electricity was tried; but it proved too costly. At length it was decided to adopt Pintsch's gas system, which, as readers are aware, has proved highly successful in this particular department of public lighting. Plant was accordingly erected in the station yard at Adelaide; and several carriages were fitted up with the new light. With the object of testing its effect, a trial trip was made on the 7th ult.; the party consisting of the Railways Commissioner (Mr. A. G. Pendleton), and a number of the principal officials and members of Parliament, accompanied by Mr. T. R. Saxton, the Engineer of the Pintsch Company, who has been in the colony since May superintending the erection of the plant. The trip, in which several ladies took part, was in every way successful; the party being unanimous in praise of the new light. The cylinders in which the gas is stored are 20 inches in diameter and 8 feet long. They are constructed of light steel plates tinned inside and out, and the seams are brazed. Each cylinder is fitted with a shut-off valve, so that they may be taken down without loss of gas if necessary when the carriage is in the shops for repairs. A sufficient quantity of gas is stored in these cylinders to supply the lamps for 24 hours' continuous burning with the lamps full on. Each carriage and lamp is provided with a bye-pass, so that the gas may be turned down to a very small flame when it is not required. The lamps in sleeping compartments are provided with silk shades. The pressure in the cylinders at starting is 100 lbs. per square inch; but this is reduced by means of a patent regulator to a pressure of 0·5 inch at the burners. The quantity of gas in the cylinders is shown on gauges fitted on either side of the carriage. Each burner consumes from ¾ to 1 cubic foot of gas per hour according to the class of lamp, and gives a light equal to from 8 to 9 candles per burner. Each double-burner lamp furnishes a light equal to 16 candles. It is expected that by the end of the year Pintsch gas will be in use in all the broad-gauge carriages and joint-stock cars running on the line between Adelaide and Melbourne.

TECHNICAL RECORD.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

Quarterly Meeting in Bradford.

The One-Hundred-and-Sixteenth Quarterly Meeting of the Members of this Institution was held on Saturday, under the presidency of Mr. W. S. Haddock, the Engineer and Manager of the Warrington Corporation Gas-Works. There was a fair attendance of members, and the items of business on the *agenda* were carried through with commendable punctuality. Directly on the arrival of the Manchester contingent at the Victoria Station, Bradford, conveyances started to take the party to

THE BRADFORD CORPORATION CHEMICAL WORKS.

The Frizinghall Chemical Works were established 30 years since by Messrs. Illingworth and Co., who at that time had the contract for the tar and ammoniacal liquor from the Bradford Gas Company's works. The works were sold in 1878 to Messrs. Spence and Stewart, from whom they were purchased by the Corporation in 1884; and since that date the plant has been almost entirely replaced by modern apparatus.

At present, sulphuric acid, sulphate and muriate of ammonia, sulphate of soda, copperas, and hydrochloric acid are produced for sale; while copper sulphocyanide, prussian blue, and oxide for gas purification have been prepared in quantity from time to time, when it has been found profitable to do so.

The furnace, containing 24 ovens, is capable of burning about 35 tons of spent oxide per week. The sulphuretted hydrogen in the waste gases from the saturator is also burnt in the ovens. The Glover absorbing tower is 26 feet high by 9 feet by 7 feet, and is filled with acid-resisting blue bricks. The three chambers have, with the towers and pipes, a total capacity of 108,500 cubic feet. The Gay-Lussac tower is 30 feet by 9 feet by 9 feet, and is filled with coke. The efficiency of the towers is good; the nitre used being less than ¾ lb. per 100 lbs. of vitriol made.

All the ammoniacal liquor is brought by gravitation in pipes from the four gas stations into a large underground storage tank. The present Coffey still, 30 feet by 3 feet by 3 feet, is of old pattern, and about to be replaced. The fixed ammonia is removed in a Colson still, 10 feet by 6 feet diameter. The saturator is circular, with conical bottom; and the sulphate is elevated by a Wilton discharger into a series of travelling buckets, which are emptied where required into the store. The waste liquors from the liming still are run into settling-tanks; the lime sludge being pumped on to the land, and the liquor treated with acid, and the blue recovered. The condensed water from the saturator gases (Devil water) is treated by redistillation in a special Colson still. The vapours are returned to the pipe leading from the saturator; and the water runs away comparatively pure.

About 10 tons of copperas are made per week—chiefly from old tins received from the Corporation refuse destructors.

In the salt-cake furnace, 15 tons of salt are used per week; and about 25 tons of hydrochloric acid and 28 tons of purified Glauber salts are produced.

A few figures as to last year's working may be interesting: 21,000 tons of liquor, of an average specific gravity of 6⅛° Twaddell, were used; 2300 tons of sulphuric acid were made; 2347 tons of sulphate of ammonia were produced, or 29·47 lbs. per ton of coal carbonized; and 450 tons of copperas were made.

Mr. Charles Wood, the Gas Engineer of the Bradford Corporation, and Mr. John Wyld, the Manager of the Chemical Department, were present, and rendered every assistance to the members in their tour of inspection round the works; so that a very good idea was carried away of the various processes by which the residuals of all the Corporation's works are here treated, in order to form a better source of revenue to the department than would result from their sale to outsiders.

On returning to the town, lunch was served in the Midland Hotel; and shortly after 2.30 the members assembled for the business proper of the meeting. On Mr. HADDOCK taking the chair,

The HON. SECRETARY (Mr. S. S. Mellor, of Northwich) read the minutes of the last meeting, and they were approved.

ELECTION OF A NEW MEMBER.

Mr. Arthur Halliwell, of Marsden, was elected a member of the Institution.

ELECTION OF PRESIDENT FOR 1899.

Mr. MELLOR proposed that Mr. R. G. Shadbolt, of Grantham, should be elected President of the Institution for the coming year. He had great pleasure in nominating Mr. Shadbolt, because last year that gentleman had relieved the Committee of very considerable difficulty. On that occasion a Senior Vice-President was elected who declined to serve; and then another gentleman was appointed, who declined on the morning of their quarterly meeting. But Mr. Shadbolt very kindly stepped into the breach. Besides, Mr. Shadbolt had been of great service to the Institution at their meetings; and he had contributed many valuable papers—especially the one on purification which he read at Buxton. He was sure Mr. Shadbolt

would do credit to the office of President—an office which had been filled by worthy men in the past, and he hoped would be held by worthy men in the future.

The PRESIDENT seconded the resolution. In promoting Mr. Shadbolt's candidature, the Committee, he said, knew they were doing one of the best things they could for the Institution. Mr. Shadbolt had great capabilities, and also took much interest in the Institution.

Mr. WILLIAM CARR said all those who had taken any continued interest in the affairs of the Institution had looked forward to the time when Mr. Shadbolt would become the President.

The resolution was put and carried unanimously.

Mr. SHADBOLT, in returning thanks for his election, said he should endeavour, with the assistance of the members, to faithfully carry out the duties of the office.

PURIFICATION.

The PRESIDENT said this subject was not being brought forward in the form of a paper, because, unfortunately, they were unable to persuade any member to write a paper; and at their last Committee meeting, it became a question of either abandoning the meeting altogether, or else bringing forward the subject in the present form. He hoped this departure from the usual course would not be detrimental to the interests of the Institution. He was much obliged to Mr. Shadbolt for introducing the subject; and he trusted it would lead to a really profitable discussion.

Mr. R. G. SHADBOLT said, as the President had remarked, this form of introducing the subject was somewhat of an experiment; and he would ask the members to bear with him if his efforts did not come up to the standard of the stereotyped paper. The question of purification was one which interested every gas manager, be his works large or small. It was a matter which all were from time to time called upon to deal with; and the conditions surrounding purification were perhaps more diverse than many people at a cursory glance would imagine. Strictly speaking, it might be taken that purification commenced at the moment the temperature of the gas issuing from the retort began to fall. The question of condensation, which was really the first stage in purification, was one with which they were not greatly concerned that day; the only point about it which, to his mind, it was necessary to refer to being that the operation was one which should be confined within certain limits. If they provided no condensers, the condensation proceeded just the same; the only thing was that it went on to the detriment of those processes which followed. Condensation should be confined to its proper sphere; and it should be accomplished before the gas was subjected to any washing or scrubbing for the removal of ammonia and other impurities. Condensation might be said to consist in the removal of all that was noxious in a gas; but, incidentally, it removed many hydrocarbons, some of which would be of great value if they could succeed in retaining them. Having, as he thought they would all agree, accepted the dictum that condensation must be confined to its proper sphere, the next process which they came to was, both in point of order and of importance, that of scrubbing or washing. Generally speaking, it was assumed that the object of scrubbing was to remove the ammonia from the gas. This was the first object; and it could be very easily performed if they could use an unlimited supply of fresh water. But, unfortunately, commercial and other considerations dictated that they should limit the supply to a very small quantity indeed. This, it had been proved, was not an altogether unmixed evil; for they found that the caustic soda itself had a great affinity for some of the impurities they had to remove. Scrubbing and washing, like condensation, must be confined to their proper sphere if they would have their condensation complete. The condensation was the all-important point in the cost of purification. They were very often puzzled to know why the cost of purification differed so very greatly. If they were to look into it, they would find that it was not due so much to the kind of purifying boxes they used as to the efficiency or inefficiency of the condensing and the scrubbing plant. [Mr. Shadbolt here referred to Statement "A."] These figures were obtained from experimental plant, and were extreme cases; but they all went to show the point that he wished to demonstrate—viz., the varying conditions that one works might labour under compared with another in the composition of the gas in the purifiers. It might be assumed at this stage that the proper thing to aim at in purification was to bring down the proportion of impurities to something comparatively constant; and this might be done by means of the liquor itself. Experiments carried out on a large scale had been pronounced a failure; but although this process had evaded their grasp so far, no doubt good work could be got out of liquor by means of judicious handling. The next table (Statement "B") would show what work the liquor did in this particular respect. It would be evident to all from the above statement that the liquor played a very important part, and that it absorbed, when rightly applied, a great proportion of the impurities which they would otherwise have to deal with in the dry boxes. Alluding to the last analysis in Statement "B," with respect to the washer-scrubber, he said he thought this showed what clean water was capable of doing by the time it became 7° or nearly 8° Twaddel, if rightly used. The next table (Statement "C") would show the actual work that was being done by the scrubbers themselves. After the work done by the scrubbers in the particular experiment to which the figures here given related, the gas would be passed through a washer where the remaining 620 grains of ammonia would be removed; but as this would affect the sulphuretted hydrogen to such a very small extent, and likewise the sulphur compounds, he thought it might be regarded as a negligible quantity. It might be taken for granted that, generally speaking, under normal conditions with mixed South Yorkshire and Midland coal, they might expect, with efficient scrubbing and washing, to find 1663 grains of carbonic acid at the inlet of the purifier, and 730 grains of sulphuretted hydrogen. Working on this basis, it was found, from actual experience, assuming that no more than two boxes were charged per week, that the area required per 1000 cubic feet per diem was 2·4 superficial feet, or 0·6 superficial foot per single box, assuming that they had four boxes to work with. The layers of purifying material would be disposed of as follows:—

Purifying Capacity Required.

Maximum Number of Changes	2 Boxes per Week.
Superficial Area Required per 1000 cubic feet per diem	2·4 sup. ft.
Superficial Area per Box per 1000 cubic feet per diem	0·6 sup. ft.
Number of Boxes	4.

Layers of Purifying Material.

Lime	4 Layers of 9 inches each, per Box.
Oxide	2 " 18 " " "

Or combined as desired with total thickness of material, 36 inches per Box.

STATEMENT A.

Comparative Proportions of Impurities in Gas at Purifier Inlet from Samples of Coal and Cannel.

Sample.	Grains of Impurities per 100 Cubic Feet of Gas.		
	Sulphuretted Hydrogen.	Carbonic Acid.	Sulphur Compounds.
Cannel	683	2478	18·40
Coal	1800	1750	32·50

STATEMENT B.

Impurities Contained in Liquor (Percentage by Weight) Drawn from Various Apparatus.

Source.	Strength Degrees Twaddel.	Percentage of Impurities.		
		Ammonia.	Carbonic Acid.	Sulphuretted Hydrogen.
Hydraulic Main	3·0	1 55	0·28	0·11
Condenser Inlet	6·1	3·27	6·49	1·05
Condenser Outlet	6·0	3·22	6·52	0·94
Scrubbers (General)	7·3	3·08	5·59	0·76
Washer-Scrubber	7·8	2·88	7·04	0·94

STATEMENT C.

Impurities Removed by Scrubbers.

Impurities.	Scrubber Inlet.	Scrubber Outlet.	Total Removed.	Percentage Removed.
	Grains.	Grains.	Grains.	
Ammonia	3598	620	2978	82·76
Carbonic Acid	2100	1663	437	20·80
Sulphuretted Hydrogen	785	730	55	7·00

STATEMENT D.

Cost of Purification when CO_2 removed.

Proportion of Materials * (approximately) = 1·25 lime to 7 oxide.

[* By weight when new.]

Lime, cost per ton of coal carbonized		1·50d.
Labour, cost		2·25
Loss in volume by removal of carbonic acid, 200 cubic feet at (say) 1s. per 1000		2·40
		6·15d.
Less profit on spent material*	= 0·55d.	
" gain in illuminating power of 1 candle at (say) ¾d. per candle × 10	= 7·50	8·05
Showing actual profit per ton of coal carbonized		1·90d.

[* Profit on spent material includes profit on spent oxide over and above its first cost.]

STATEMENT E.

Cost of Purification when Sulphur Compounds are kept below 20 grains per 100 Cubic Feet.

Proportion of Materials* (approximately) = 2·5 lime to 7 oxide.

[*By weight when new.]

Lime, cost per ton of coal carbonized		3·00d.
Labour, cost		2·75
Loss in volume of carbonic acid (as before)		2·40
		8·15d.
Less profit on spent material	= 0·45d.	
" gain in illuminating power (as before)	= 7·50	7·95
Net actual cost per ton of coal carbonized		0·20d.

Having fixed the conditions, and decided upon the capacity of the purifiers themselves, the next and vital question which presented itself was to what extent should they purify. He would divide this subject into three heads: (1) The removal of the sulphuretted hydrogen, which, in itself, was imperative; (2) the removal of the carbonic acid; (3) the removal or the reduction of the sulphur compounds to something like the Gas Referees' requirements. The first might be disposed of very quickly. All would agree that the use of oxide of iron for the purpose of the removal of sulphuretted hydrogen alone cost nothing, when the value of the spent material was taken into account; and, in fact, in some instances, it resulted in an actual profit. Coming to the second stage—the removal of the carbonic acid—from his own experience, corroborated as well as added to by the experience of others, he found that the working would be something approximating to what he had shown in Statement "D." Coming to the third, or more complete stage, it would be found that the cost was a little more (see Statement "E"). These costs were not historical in any shape or form; they were taken from practical everyday working, under conditions approximating to those previously stated. They were not all from his own experience, but were verified by the experience of both larger and smaller works, and, he thought, might be taken to be fairly representative. So far he had dealt with purification unassisted by the use of free oxygen. The point he wished to submit for discussion by the meeting was this: That considering that what might be termed complete purification might be achieved at a cost of 2d. per ton of coal carbonized, taking into calculation the losses and gains on every hand, no one was justified in sending out gas partially purified. Whatever spark of argument to the contrary might be brought forward, would disappear when it was borne in mind (as he pointed out at the Buxton meeting of the Institution) that the life of the oxide itself might be prolonged threefold by the judicious use of air, moisture, and warmth; and that whatever cost there might be remaining would be entirely removed, and an actual profit result, even when complete purification was attained. Sulphur clauses or not, it was their duty to themselves, to their customers, and to everybody interested, that they should religiously purify their gas to the utmost extent, especially when it was seen that it cost practically nothing to do so.

Mr. E. E. J. Anderson (Ripon) asked at what point Mr. Shadbolt considered the condensation complete before passing on to the scrubber.

Mr. Shadbolt replied that he considered condensation complete when what was termed the tar was removed.

Mr. Anderson asked if Mr. Shadbolt considered it was complete at 60° to 70°.

Mr. Shadbolt said he attached very little importance to the temperature, but more to the state of the gas.

Mr. J. H. Brearley (Longwood) said that, knowing the subject of purification was going to be introduced, he had taken out some figures in connection with his works. During the last 22 months, they had actually made a profit from the purification; but he did not want anybody to conjure up Utopian dreams of profit from purification, because during this period they were in a favourable position for selling their spent oxide. They actually made a profit of £18 13s. 10d. The quantity of spent oxide sold was 107 tons; and roughly calculating 50 tons of new to replace the 107 tons sold, this would cost, at 25s. a ton, something like £68, which would bring the outlay on purification during the period mentioned to £54 16s. 2d. The quantity of gas sold was 91,478,000 cubic feet; so that allowing for the outlay on new material, which was the first thing to estimate when seeking to arrive at the cost of purification, it was costing them ¼d. to purify the gas. Their maximum make was about 300,000 cubic feet per day. They had four 20-feet boxes filled with oxide. Lime boxes were used as catch boxes; and the gas was passed through the oxide. The sulphur was kept within reasonable limits; and they had had no complaints either of sulphur or want of illuminating power during the last eighteen months. They also tested the lime boxes, and kept the gas free from carbonic acid. He ought to add that his results had been obtained without the admission of air. He should like to ask Mr. Shadbolt if he would give them any test he had made respecting the admission of steam and air, and as to what effect it had on the illuminating power. He could not convince himself that the admission of air did not reduce the illuminating power. He had carried out experiments, in order to test the utility or otherwise of the admission of air; and at present he was quite content to do without it. On looking through the analyses of 32 large works, he found that there were only three where the figure was below ¼d.; and seeing that this was the case, he was quite satisfied to leave air alone.

Mr. J. Wilkinson (Drighlington) was much obliged to Mr. Shadbolt for bringing this important subject forward, and giving them his experience. On looking into the purification accounts of various gas undertakings, he found that almost every manager had a different way of making them up. According to the Parliamentary Returns, they were supposed to include in their purification charges the oil and water used on the works; but he failed to see why purification should be debited with these items. Some gas companies were far better situated for the disposal of their spent oxide than others. He had sold oxide at 4½d. per unit at the works; whereas his next door neighbour had had to be content with 2½d. He derived his advantage solely through his trade in vitriol; and it would therefore be unfair of him to compare his accounts with those of his neighbour. He noticed that Mr. Shadbolt allowed for the loss in volume of carbonic acid, but did not allow for loss in volume of the sulphur compounds. The point that struck him in Statement "B" was that 6·1° Twaddel took out 3·72 per cent. of ammonia, 6·49 per cent. of carbonic acid, and 1·05 per cent. of sulphuretted hydrogen. These were the highest figures, with the exception of one item of carbonic acid. He should like to ask Mr. Shadbolt's opinion as to really the best Twaddel for liquor. They found, in the manufacture of sulphate of ammonia, that about 5° Twaddel was the most convenient strength to work liquor; and from this he should judge that it would not be policy to work their liquor at any higher strength.

Mr. William Carr (Stalybridge) said Mr. Shadbolt did not tell them how he arrived at the figure of 7·50d. as the gain in illuminating power, which formed a very large feature in the improvement; and he should like fuller particulars with regard to that when he came to reply. The question of purification, as Mr. Shadbolt had stated, began almost as soon as the gas commenced to cool; and the scrubbers or washers played a very important part in it. Some years ago, when they used to sell their liquor, there was no doubt what was the best way to do the washing. But now that they had become sulphate manufacturers, a different complexion was put upon it. He was not quite sure that it was any special advantage to take out the sulphuretted hydrogen from the gas, and then have to remove it again from the sulphate purifiers. If they had a sulphur kiln, it would be another matter. He saw no special advantage in getting the sulphuretted hydrogen into the gas liquor, because they then had to deal with it in a way that was sometimes considerably more troublesome and obnoxious. With regard to the last speaker's query as to what strength of liquor was best calculated to remove impurities, it depended very largely on the quantity of impurities it came in contact with as to its effectiveness. The tables before the meeting could only be taken as approximate, because the quantity of impurities in the gas had to be considered, as well as the liquor used for taking them out. There could be no doubt that a liquor of no strength Twaddel was the best. What they wanted was a solution of caustic ammonia—that was free ammonia—which did not register on the Twaddel hydrometer at all. In testing it by the Twaddel hydrometer, they obtained no guide as to the amount of ammonia there might be in the liquor they were using; and sometimes this was very misleading. As sulphate makers, they would be better without either carbonic acid or sulphuretted hydrogen in their liquor. They would not require to use lime in their still; and, therefore, they would obtain the ammonia from the liquor very much more readily, and probably get a nicer quality of salt. But this was by the way. On the question of purifying in closed vessels, as a sulphate maker he would like to state that the principal point of interest was getting out the ammonia from the gas. There was no advantage in getting it out by the liquor, because they had to deal with it afterwards in a less convenient form than they did in their ordinary purifiers. When they used to sell their liquor by the Twaddel hydrometer, the more impurities they could ram into it the better. He remembered some wonderful results being obtained at one works where they put up tower scrubbers. They got some fabulous results because they charged the liquor with very large quantities of impurities; and as they sold by the Twaddel test, they were paid for ammonia instead of having it deducted, because the liquor was really of less value than other liquor. As had been said, liquor of 5° strength was often the best liquor for working in the ammonia still, and gave the best results of working in proportion to its value. During the present summer, he had been using the air process in trying to work off the oxide purifiers; and a point that had struck both him and his brother was their increased troubles with naphthalene deposits. His brother drew his attention to it in the first place by saying that he found, when his apparatus had been going a very long time, towards the latter portion, the naphthalene troubles increased, and he had been obliged to change his purifiers long before they were shown to be exhausted, in order to prevent the deposit of naphthalene throughout the outlying districts of the town. He found that by reducing the quantity of steam so as to get in about 1½ per cent. of air—which he had never noticed to interfere with the illuminating power in any instance—his naphthalene troubles had diminished. He mentioned this because it might be of advantage to point out to those who were using the air process the advisability of exercising exceeding care in putting the steam in. It was shown by Mr. Shadbolt (and accorded with his own experience) that by getting the steam and air near to the purifiers, so that the steam went in to a certain extent as steam, they got a far higher duty in the way of revivification than they did by putting in the steam a long distance away, so that it was condensed before it got to the purifiers. The moisture being in conjunction with the air seemed to give a greater effect to the action of the air in the purifiers. He had found it a very easy matter to set the oxide on fire in his sulphate purifier. This led to a little trouble; but it showed that the activity of the oxide in the air took place to a much greater extent, or with much greater energy, when it was accompanied by the warmth and moisture of the steam than it did if it were put in in a dry condition. The only difficulty in dealing with it was that they had to remember that when they let in the steam, when the oxide

was nearly spent, a larger quantity went forward with the gas, and then when it got out into the street-mains, more especially in small services and places where it was exposed to changes of temperature, the steam was condensed, and in the act of condensation deposited naphthalene. There was no doubt it had some effect upon naphthalene, because it was still as elusive as ever, and they were still as far off any solution of the naphthalene question as ever. But he had no doubt, from his own experience and from what he had gathered from others, that the fact of the steam being admitted into the purifiers did affect the deposit of naphthalene in the street-mains. He was much obliged to Mr. Shadbolt for the way in which he had opened the discussion, which was certainly a new departure that was well worth following. It was not always convenient to the members of the Institution to write papers, but probably when they found they could introduce a subject in the way this had been introduced, they might feel more disposed to do it than they would if they had to set to work to write out a set paper in the usual way. Mr. Shadbolt had put before them a very important subject; and he (Mr. Carr) only regretted that he did not know a little beforehand the lines he was going to take, so that he might have prepared himself for the discussion. He hoped they would hear something more on the lime question; and he trusted that Mr. Townsend would give them a word or two on the point.

Mr. H. Townsend (Wakefield) said, as Mr. Carr had dragged him into the discussion, there was no way of getting out of it except by following on the lines indicated. In the first place, he wished to congratulate Mr. Shadbolt on the excellent way in which he had introduced the subject. He (Mr. Townsend) was taken by surprise, and did not expect to receive all the information he had obtained. If Mr. Shadbolt had prepared a set paper, it could hardly have contained more. With regard to the question of purification, he (Mr. Townsend) certainly did hold some rather strong opinions. He had not the slightest doubt in his own mind that it was the right thing to extract all the carbonic acid; and he was very glad to find that Mr. Shadbolt also took such a strong line, and had so unhesitating an opinion in favour of taking out the sulphur compounds as well. At Wakefield, although they were only under the ordinary provisions of the Gas-Works Clauses Act, and therefore merely limited to removing the sulphuretted hydrogen, yet, as the Corporation had appointed a chemist to analyze their gas, they found it would be expedient to remove all the sulphur compounds—so that, although they were under no obligation in this respect, they did take out all the carbonic acid and all the sulphur compounds. The reason he had so strong an opinion about the former impurity was this: As most of the members were well aware, some two or three years ago he was Engineer of the Plymouth Gas-Works. When he first went to that place, he travelled down on a winter's day. He had a very long journey, and not having much to do, he amused himself by looking at the gas at the different stations through which he passed, and trying to settle in his own mind the method of purification adopted. This he found to be a very easy task. It was not difficult for any expert to detect when the purification was simply done with oxide of iron, and when the process was backed up by the elimination of all the carbonic acid. Purification simply by oxide of iron produced a gas that was distinctly yellow; while gas purified of carbonic acid was white. He made some notes with the object of ascertaining whether or not his impressions were correct; and on making inquiries subsequently, he found they were. When he got into the southern part of Devonshire, he was struck with the difference in the appearance of the gas from what it was in the Midlands. There it was exceptionally white. He found in town after town a gas of very low illuminating power, but very white; and he came to the conclusion that this part of Devonshire was a limestone district. Next morning, when he visited the gas-works, he was anxious to find out whether or not the deductions he had drawn were correct. Accordingly, one of the first questions he put to his predecessor was as to whether they did the purifying altogether with lime. The reply was in the affirmative. He was told that it was entirely a limestone district, and that the buildings were all of limestone. On one occasion while at Plymouth, having to visit the Midlands, he went to the Post Office of one of the large towns, and was struck by the sulphurous atmosphere caused by the gas. Of course, by purifying altogether with lime, as they did at Plymouth, the gas was exceptionally pure. He then came to the conclusion that it certainly paid to take out the sulphur compounds; and further experience had amply confirmed him in this opinion. He was quite at one with Mr. Shadbolt that, apart from the financial aspect of the question, as a commercial transaction it paid to remove all the sulphur compounds they could possibly take out, and also every particle of carbonic acid. If they wanted to take the sulphur compounds out, they must remove the carbonic acid. He also agreed that it cost very little to do; and that, taking out the carbonic acid made a difference of at least one candle in the illuminating power. Of course, he was not in a position to criticize Mr. Shadbolt's figures, as they had only just come into his hands.

Mr. G. E. Stevenson did not know whether Mr. Townsend had lately visited the city of Manchester; but if he had, he would have found that the gas was a little whiter than it was in some modern towns. He was afraid that Mr. Townsend was not quite right in suggesting that the absence of carbonic acid was the sole reason for the gas appearing white. He was rather inclined to think that there were various ways of making gas a pure white—some, perhaps, more costly than others. He was much indebted to Mr. Shadbolt for bringing the subject forward in the way he had. Of course, purification was a vast subject, and one that had so many side branches that any one of them would form the subject of discussion. It was better to have the question brought before them on general lines, so that they might take general views of it. They would all accept Mr. Shadbolt's proposition that the beginning of purification was the deposition of tar from the gas—in fact, purification could not take place until this had been accomplished—and then began the abstraction of further impurities. He was inclined to think, from his own experience of the last half dozen years, that the abstraction of carbonic acid was perhaps one of the most important factors. There was no doubt in his mind that the great proportion of carbonic acid in the gas in northern towns was very largely attributable to the reluctance of some gas-works' proprietors to launch out into the question of sulphur purification. Where considerable amounts of cannel, of the medium coal from the Wigan district and the Nottingham district were used, the proportion of carbonic acid was very rarely less than 2½ per cent. Now this was a very difficult quantity to deal with in sulphur purification. In London and the southern towns generally, the carbonic acid did not exceed 1½ per cent.; and then, of course, it was more amenable to control. But if, with 2½ per cent. of carbonic acid in the gas, they in Manchester were to go in for sulphur purification, it would mean a very great consumption of lime. He did not say it could not, or ought not to be done; but seeing that the expenditure of lime would be great in proportion as the carbonic acid in the gas was high, he thought they ought to cast about to see if there were not means of previously reducing the carbonic acid in the gas. This he saw from Mr. Shadbolt's figures could be done to a certain extent—in fact, according to these figures it would be seen that something over 25 per cent. of the carbonic acid was taken out in the condensing and washing appliances previous to the purification. This was a very good result, so far as it went. But he believed they were all acquainted with the fact that there were gentlemen in the profession who were endeavouring to do something much further than this, by washing gas with liquor which had been freed to a large extent from its carbonic acid fixed in combination with ammonia, and using the liquor over again. He really thought that many of them might with advantage devote some attention to this side of the question, and endeavour to ascertain whether it was not possible, by means of apparatus of moderate cost, to effect the abstraction of a much larger proportion of the carbonic acid—in fact, something amounting to 40 or 50 per cent., instead of 25 per cent. If they could do this, they would be in a much better position to deal with the question of purification from sulphur. Of course, it was rather difficult to discuss Mr. Shadbolt's figures, or to call them in question; but he was inclined to think that he erred in one respect—viz., in regarding the keeping of the sulphur compounds below 20 grains as involving greater expense in time than the purification of carbonic acid. He could not conceive why more lime should be required in purifying from sulphur compounds than in purifying from carbonic acid, if the purification from carbonic acid was complete. There was no doubt that the consumption of lime, in purifying with lime, was to be regulated by the carbonic acid in the gas. It was always in excess. It always had to be taken out before the sulphur compounds could be reduced; and the quantity of lime that required to be used depended entirely, in his opinion, upon the proportion of carbonic acid. Mr. Carr had made some very pertinent remarks in regard to the use of air and steam in oxide purification. To his (the speaker's) mind, the application of air was far more useful in connection with lime than with oxide. It had been found by those who used lime in sulphur purification that it was absolutely necessary to maintain the sulphur purifiers at a certain temperature, approximating to 90°. The simplest and best way to do this was to introduce into the purifiers a certain proportion of air, which, having a chemical action in conjunction with the lime and the sulphur, maintained the temperature. The easiest method of injecting this air into the gas was by a steam-jet. In using steam, there was something to be said in favour of the oxide lasting a longer time, and doing more work. It lasted longer, perhaps, because it remained in a porous and free condition, and did not cake. There was no doubt it wanted a good deal of careful control and supervision, because one got a good deal of moisture in the gas which tended to produce naphthalene deposits. He was convinced that the more saturated the gas was with moisture as it entered the street-mains, the more likely it was to cause naphthalene troubles. In conclusion, he expressed his appreciation of the way in which Mr. Shadbolt had come forward with the subject, putting it before the meeting in a general way so that it was open to discussion on all sides.

Mr. G. H. Niven (Cleckheaton), as an old friend of Mr. Shadbolt, wished to thank him for the able manner he had dealt with the question of purification. Having had some experience in the matter, he should like to ask Mr. Shadbolt for his hypothesis on the use of moisture. When Mr. Shadbolt had charge of the North Bierley works, he saw his system, which he would now term (for want of a better word) "hot purification."

He introduced it at his own works with great advantage, for some time, so far as the life of the oxide in the purifiers was concerned; but the advantage so gained was discounted by that pest to which Mr. Carr had referred—naphthalene in the services, &c. In considering oxide purification, any one thinking over the matter for a moment would come to the conclusion that the time at which oxide of iron was doing most work in abstracting the sulphuretted hydrogen from the gas was when it was anhydrous. If that were so, they must look for a new hypothesis. From certain experiments he had made, and from his experience with naphthalene troubles, he had now come to the conclusion that the extra life obtained for the oxide of iron in the purifiers was not due altogether to the amount of moisture introduced by the steam, but to the fact that, condense as they would, certain light hydrocarbons would find their way into the purifier boxes, and, under the system of cold purification, as soon as they came in contact with the under side of the lid, and the sides of the purifier, they condensed and filled up the cells of the oxide of iron which was lying in the purifier, and in so doing they robbed them of the bulk of the material lying in the boxes. The benefit that was derived from the introduction of hot purification was due to the fact that, owing to the temperature in the boxes being raised, the light hydrocarbons were sent forward, and the cells of the oxide remained open, and offered a larger surface for chemical action to the incoming gas. With the hot purification process, when they pumped the gasholder syphons, he found they had a large amount of light oils floating on the water so pumped from the syphons, and he had some trouble with naphthalene deposits in the mains. In his opinion, the members meeting together and discussing this important subject was of great benefit to all.

The PRESIDENT, before calling upon Mr. Shadbolt to reply, wished to thank him for the very interesting subject he had brought forward that day. He thought the way in which the matter had been introduced would lead to great benefit being derived both by the consumers of gas and the managers of works. The profit of 0·2d. shown in Statement "E" depended very much upon the cost of the lime, and the price they could get for the spent lime. In Warrington some years ago they got 4s. a ton for it, whereas now he did not think they could get rid of it at any price, but would have to go to the expense of finding a tip for it. Lime certainly gave gas a brighter appearance. They had to use rather more cannel; but in Warrington, being near to the cheap cannels, they could buy them at practically the same price as coal. Now they only used lime on very exceptional occasions. In using lime, they found great difficulty in working the oxide and lime together. The boxes were so situated that they could not have one box and devote it entirely to lime; and consequently they had to clean out their boxes every time they used them. Otherwise, they had a great loss in the spent material. Another difficulty that they met with was in the traces of sulphuretted hydrogen they found. He had had a return showing the quantity of sulphuretted hydrogen leaving the purifiers. The purifiers were put in a row 47 feet by 20 feet. The first purifier took out practically all the sulphuretted hydrogen. The quantity of sulphur passing after the first purifier was about 100 grains per 100 cubic feet. In the second purifier it was reduced to 50 grains. The next contained only a trace of sulphuretted hydrogen; and so on from one purifier to another. The lime would take out the traces of sulphuretted hydrogen much more readily than the oxide would. They had tried one little experiment at Warrington with the introduction of air by the steam jet, with a very melancholy result. They started at noon and put in 1 per cent. of air for six hours; and next morning he was informed that the whole of the street-lamps were blocked. If they used steam, it was very necessary that they should start with their oxide fresh; for if they started with old oxide, it had a tendency to drive the naphthalene forward.

Mr. SHADBOLT, in reply, said that when he brought forward the subject he was rather doubtful of raising any discussion; but he was happy to say this doubt had been dispelled. Mr. Brearley stated that his purification cost him ½d., and that he removed carbonic acid. Statements "D" and "E" showed the benefit to be derived from removing the carbonic acid. Mr. Brearley did not show a profit because he did not credit himself with any gain in illuminating power. There was a decided gain in this respect by removing 2 per cent. of carbonic acid. In reply to Mr. Brearley's question as to the effect on the illuminating power produced by using steam and air, he would refer to the paper that he read at the Buxton meeting, at the end of which would be found a short statement giving the effect of introducing various proportions of air. If his memory was correct, anything up to 1½ per cent. had no deteriorating effect. In reply to Mr. Wilkinson, as to the loss of the sulphur compounds, he had treated this almost as a negligible quantity with regard to the effect upon the volume of the gas. Perhaps some of them would wonder why he had omitted giving sulphur compounds in his analyses; but this was because he had not got them. As to the strength to which the liquor should be worked, as a sulphate maker he should prefer to have his liquor not above 5° Twaddel. His aim was to show what could be done with the liquor in the way of removing impurities; but as to the effect in sulphate making, perhaps Mr. Wilkinson would let them know something later on. It would ill become him to attempt to deal with Mr. Carr's remarks, which were very exhaustive. With regard to the illuminating power gained for the gas by the removal of the carbonic acid, he could only say in corroboration of what he had stated, that the water-gas makers said there was a distinct loss experienced by leaving in the carbonic acid, but that they could enrich so cheaply that they did not trouble to take it out. With respect to the naphthalene troubles, he was sorry to say that naphthalene could be largely increased by the adoption of the air and steam process. He had discovered this after using it for some considerable time; but the difficulty was not insurmountable. It was a question of regulating the moisture. When using oxide boxes, if a thin layer of lime were placed at the bottom, and care taken to condense out the greater proportion of the steam before it entered the purifier, he thought the moisture could be kept within such bounds as to have no detrimental effect with regard to naphthalene. He was much obliged for Mr. Townsend's remarks, which corroborated his own. He could not quite agree with Mr. Stevenson, though he felt he must bow to his more extended experience; but, so far as his observations, and those of his friends went, he was certainly correct when he said that it took more time to remove the sulphur compounds under the conditions he stated than it did to remove the carbonic acid. He was sorry to hear that he had brought Mr. Niven into such trouble. He seemed to have got a lot of people into trouble with the steam process. He took it that the action in question was this—that the use of the moisture was not so much to assist the oxide (as such) to do its work, as to re-oxidize the spent material. He did not think the effect of the use of moisture was an hypothesis; it was a demonstrable fact. He thanked the President for adding to his statement, and commiserated him upon his melancholy experience. He remembered one gentleman who lived in the neighbourhood, and was a chemist of the first order, who adopted the process only to drop it like a hot potato, for the simple reason that he saturated his gas to such an extent with steam that his oxide was literally mud. Of course, in such a case as this, the result would be most melancholy indeed; but there was a happy mean which should be adopted. He could not give the exact humidity required; but there was not the slightest doubt that, when the happy mean was once found, the effect would be beneficial all round.

THE LATE ROBERT HUNTER.

The PRESIDENT said before proceeding with the next business on the *agenda*, he had a melancholy duty to perform, and one that he would have brought forward earlier in the day but for the fact that he had waited till there was a full meeting. He wished to propose the following resolution: "That the Manchester District Institution of Gas Engineers tenders a vote of condolence to the widow of the late Robert Hunter."

Mr. R. PORTER (Elland) seconded the resolution. He said he had been intimately acquainted with Mr. Hunter for many years; and he was quite sure the members of the Institution had the sincerest sympathy for his widow and children. The members were already showing their sympathy in a practical way; and if there were any members present who from any cause whatever had refrained from subscribing to the fund which was being raised for this purpose, he hoped they would reconsider any decision they had come to, and look upon it as a duty to help Mrs. Hunter and her young children. He knew what it was to have to battle with life; and when he heard of the death of Mr. Hunter, and knew that his family were not well provided for, he felt it was his duty and the duty of every member of the Institution to do something for the fatherless and the widow.

The vote was carried unanimously.

The SECRETARY wished to call the members' attention to the present state of the fund which had been raised in response to the circular he had sent out on Nov. 1. It was very desirable that the fund should be closed as early as possible; and therefore, it was intended to have a Committee meeting to deal with it on Tuesday week, so that if there was any member who had not yet subscribed he should be glad if he would send his mite as soon as possible. Their fund was confined to members of their own Institution, and up to that morning the amount promised was £112 10s. 6d. Included in this amount there were ten subscriptions of 5 guineas, and one of £5. There were only 51 subscriptions in all, out of a total number of members of something like 130 to 140, which to his mind was not enough. There had also been a fund raised by the "JOURNAL OF GAS LIGHTING" from friends of the late Mr. Hunter; and Mr. King had intimated that this fund would be disposed of in a somewhat similar manner to the one they were themselves raising, as they were more likely to know the circumstances in which Mrs. Hunter was placed and how the money could be most beneficially applied. He purposed sending out another circular to those who had not subscribed, and he trusted they would reply to it by the first Tuesday in December.

Mr. J. H. BREARLEY (Longwood) then read the following paper—

THE BALANCE-SHEET.

This subject is a far-reaching and important one; and when the treatment of certain items in the preparation of the balance-sheet may produce serious difference in the purchase value of a statutory company, careful consideration is called for. The method of treatment, too, of various items of expenditure, produces a material influence upon comparative analyses; and an

absence of uniform methods renders the latter more or less unreliable. But more will be said about this later.

In opening the balance-sheet of a statutory company, one usually finds the "Statement of Share and Loan Capital" at the head. Generally speaking, these accounts afford a rough idea of the stability or otherwise of the financial side of the undertaking when compared with the amount of gas sold. But this, in many cases, may be more apparent that real. The following comparative table of nine Yorkshire Companies of similar size gives an effective illustration of this. The figures are taken from the Board of Trade returns for 1896.

No.	Annual Sale.	Capital Paid Up.	Average per Million Cubic Feet.	Dividend on Ordinary Stock.
	Cubic Feet.			Per Cent.
1	39,234,000	£40,920	£1043	5
2	50,854,000	24,500	481	12
3	48,833,800	39,500	808	10
4	46,127,000	44,270	959	7
5	40,607,000	24,877	612	11
6	41 099,700	25,000	608	10
7	41,577,900	43,304	1041	8½
8	51,000,000	18,666	366	9
9	34,996,800	25,500	728	10
Totals . .	394,330,200	£286,537	..	..
Average of works.	43,814,466	£31,837	£727	..

In one or two of the above cases, the obtaining of statutory powers was attended with keen opposition. Lawyers, parliamentary agents, and experts, had a harvest home. The capital accounts of the poor companies became considerably larger, under the heading of "Costs of Promoting Special Act;" and either shareholders or consumers have had to pay the piper ever since.

But this is an abstruse matter. Something else is needed to explain why the ratio of capital per million of works of similar size in the same county should vary from £366 to £1043. The most plausible explanation seems to be that the undertakings with the smallest ratio have been working too near the borderline of disaster, and have neglected to keep the works well abreast of the requirements of the district. On the other hand, when the proportion of capital per million sold gets into four figures, it seems to indicate a lavish and injudicious expenditure at some period in the history of the undertaking. In very small works, especially if an Act has been applied for, the four-figure ratio may have been unavoidable; but in any case of this kind, whether in large or small works, it ought to be the special aim of those responsible to foster the consumption by all possible means, without unduly adding to the burden of capital. Among the accounts of companies which I received, the ratio of capital per million sold was found to extend from £351 to £1364.

In circularizing the members for a copy of their last accounts, it was my intention to get out some figures respecting the actual amount of unredeemed capital on corporate undertakings; but I had reckoned without mine host, the balance-sheet. The producers of some of these interesting documents seem to have got the impression that simplicity is not by any means the acme of perfection; and the way in which the sinking funds, annuities, and loans get inextricably mixed up with other matters is enough to drive a man crazy, even though he may fancy himself a bit of an accountant. On the other hand, there are corporate accounts that it is a real pleasure to peruse—one has but to read to understand; and were it not that I had pledged myself not to mention the names of undertakings, I should feel impelled to give special commendation to the lucid accounts issued by a few corporations, and copies of which I have been fortunate enough to secure. In despair, I turned to the Parliamentary Returns; and though their publication is something akin to ancient history, they proved to be of some value, and helped to extricate me from the fog into which I had unwittingly plunged myself.

For 1896, the returns give the amount of capital paid up and gas sold by Companies to be as follows:—

Share and premium capital	£41,433,325
Loans issued	8,185 700
Total	£49,619.025
Gas sold	73,750,533,649 c. ft.
Ratio of capital per million cubic feet, sold.	£673

The returns for Local Authorities for the same year are as follows:—

Amount of loans and capitalized value of annuities authorized	£29,984,828
Less amount of loans repaid, annuities redeemed, and amount placed to sinking fund.	6,057,445
Net capital	£23,927,383
Gas sold.	43,132,780,085 c. ft.
Ratio of capital per million cubic feet sold.	£555

This gives a difference in favour of corporations of £118 per million. The companies, too, have a greater percentage of interest or dividend to raise upon the larger ratio of capital.

The question of municipal *versus* company control of gas-works, was ably dealt with at Bath last year; but there is one point to which an allusion may be made here—that is, that the amount required for sinking fund and repayment of annuities cannot be set off as a permanent disadvantage to the corporate consumer, for he is gradually reducing the capital ratio, and if he lives long enough will obtain his reward in cheaper gas. But this is subject to one condition; and the whole question hinges upon it. As Mr. Isaac Carr has so ably shown us, he ought not to be called upon to practically make a free gift to the local authority of the control of the gas supply, and be fleeced on behalf of the rates in addition. Then municipalization becomes a disadvantage. At this point, one instance comes to my mind of a large corporation heavily burdened with capital, with a big price for gas, quite recently appropriating a large sum in aid of the rates. Yet all the while the large expenditure on capital account hangs like a millstone round the neck of the gas undertaking. Is there any wonder that, under such circumstances, electric light is rapidly developing? Another corporation claim credit for having placed a sum of nearly £1500 for new mains, services, and meters, to revenue, which should have been placed to capital; while in the same year the consumers were taxed to the extent of 2·63d. per 1000 cubic feet for the sinking fund, and 1·77d. for the borough fund. The consumer would probably not have objected to being excused payment of the last item. This is but typical of most corporate undertakings.

In these days, when so much is being said and published about cheap gas, it is well to bear in mind the anomalous position which statutory companies hold as compared with local authorities, in respect to the capital employed. Parliamentary obligations render it practically impossible for even over-capitalized companies to effect a reduction of capital, since profits must not be utilized for this purpose. A substantial increase in the sale of gas may improve the proportionate ratio; but interest and dividend must be provided year after year on a never reducing, but almost invariably increasing, capital account. Local authorities, on the other hand, are compelled to repay their loans, and redeem their annuities, in a given term of years; and year by year the ratio of interest decreases. In this way, those local authorities who were fortunate enough to secure the gas undertakings a good many years ago, are now reaping the reward of the reduction of capital expenditure; but, generally speaking, the first few years following the acquirement of a gas undertaking press more hardly upon the consumer than if the concern had not changed hands.

It has been stated that the rate of interest on loans which companies are called upon to pay, as compared with corporations, is about 15s. per cent. more. As bearing upon this matter, it may be said that out of 26 companies effecting loans, 11 have been able to secure all or part of their loans on promissory note or mortgage at 3 per cent. The rate of interest on all loans varied from 3 to 4½ per cent.; and unless the companies paying the latter rate have bound themselves to retain the loan for a long term of years, there seems to be little reason why they should continue to pay 50 per cent. more interest than others. Another remarkable instance was supplied in the fact that a large corporation pay 3¼ per cent. on over £70,000, while a neighbouring gas company have managed to secure a loan of £10,000 at 3 per cent. About twelve months ago, a Yorkshire company endeavoured to reduce the rate of interest paid on loans. An advertisement was inserted in several Yorkshire papers offering 3¼ per cent. for loans on promissory note; but only one application of £500 was received.

Now as to the capital and revenue accounts. Under the prescribed form of accounts, provision is made in the capital accounts for new meters (not in place of old ones), including fixing. It seems to be quite a common thing for local authorities to debit the cost of all new meters to revenue—a practice that will ultimately hurt the consumers less than the appropriation of profits. One corporation, for example, finished the year with a loss of £118; and a foot-note in the statement of accounts explains that this unhappy result was brought about by placing items to the revenue account which ought to have been placed to capital. But several companies do the same thing, even paying for prepayment meters out of revenue. The rush for prepayment meters proved too much for some companies paying for meters out of revenue; and they struck a middle course—prepayment meters being debited against capital, and ordinary meters against revenue. I am speaking, of course, purely of meters for new consumers. Debiting revenue with all meter charges undoubtedly conduces to the stability of an undertaking; and if overcapitalized, it may be a very shrewd policy to adopt. But where the shadow of being purchased by a local authority hangs over the concern, then it effects a reduction of net income or profit, upon which the purchasing value is usually estimated. If a company (say) debits revenue with £200 per annum for meters that could legitimately be placed to capital, the loss in purchase value, at 28 years' purchase, would be £5600. This holds good with any other item put to revenue that could be properly debited to capital. But there is another phase to the question. Any undertaking whose Special Act incorporates with it the Gas-Works Clauses Act of 1871, is, according to clause 35 of the latter, liable to a penalty of not less than £2 per day so long as the accounts are not made out in compliance with the particulars specified in Schedule B annexed to that Act. This schedule clearly interprets that new meters not in place of old ones should be charged to capital.

The practice of paying for items of capital expenditure out of revenue, cannot be said to injure a company who continually realize an amount sufficient to pay maximum dividends. It is the consumer who then suffers. One company paying maximum dividends actually charge all the cost of new meters (including prepayments) to revenue, and a large proportion of the cost of new stoves which are let out on hire, in addition. This is undoubtedly an injustice to the consumer. As no stocks of fittings or stoves are kept, it is easy to imagine, too, how this company can cut its coat to suit its cloth. If a good year has been experienced, a large stock of stoves may be laid in (say) in December, and thus keep the revenue profits within manageable limits. If adversity strikes the company in any succeeding year, the stock can be reduced to the advantage of current expenditure; and as new stoves will not weigh so heavily on the debit side of revenue, the profits will still be good. Meters can be manipulated in the same way. Of course, I do not for a moment suggest that the responsible persons of this company are guilty of these tactics; but they have proved themselves remarkable tacticians when burdened with too much surplus. As ratepayers, the consumers may some day get their own or a portion of it, if the mantle of purchase should happen to settle in that district.

In some balance-sheets, receipts for spent lime or oxide are placed on the credit side of revenue account. It would be better to deduct receipts of this kind from the outlay on purification, as, indeed, is already done in most cases. The net cost of the latter is then obtainable at a glance. When comparing analyses of the cost of purification in small or medium-sized works, an average should be taken over four or five years, as it frequently happens that a purchase of oxide will suffice for two or three years. If in a given year no oxide is bought, and at the same time a consignment of spent material is sent away, the cost of purification will be much below its normal average.

In all instances, comparisons of the cost of repairs and maintenance of works, mains, and meters should extend over a number of years. Published analyses should form a good index of what a fair average expenditure is. Yet, in a recent arbitration case, there seemed to be a difference of opinion even among experts as to whether 4d., 5d., or 6d. per 1000 cubic feet was a fair expenditure on maintenance of works. Some companies and corporations, too, prefer to swell the expenditure under "Repairs" with items that could legitimately be placed to capital account under the heading of "New Works;" while under some circumstances there is a temptation to adopt the opposite and less excusable policy. Of the balance-sheets which have been sent in, the average rate per 1000 cubic feet sold (not including used on works) at which maintenance of the works was carried out during the past twelve months has been taken.—See Tables A to G, on opposite page. The rate of 30 companies was found to vary from 1·42d. to 6·73d.; while the average over all was 3·14d. A digest of the accounts of 25 local authorities showed the average rate to be 3·24d.; the rates varying from 1·13d. to 8·02d. Figures covering no less than 55 works must be taken as fairly representative, since works having a minimum of repairs are balanced by those engaged upon extensive alterations, and consequent writing off of abnormal sums for old plant displaced, &c. For example, the engineer of No. 8 in Table G, writes me to say that they have been spending heavily on renewals and repairs. They have closed one works as a manufacturing station, and enlarged another works to the extent of three-quarters of a million cubic feet per diem. Yet, in spite of this heavy expenditure, the rate only works out at 7·63d. The total gas sold by 32 undertakings was 62,119,939,000 cubic feet and the repairs were carried out for £886,560, or 3·425d. per 1000 cubic feet sold. As these figures cover the operations of more than half the gas manufacture of the United Kingdom, they afford convincing proof that 3½d. per 1000 cubic feet is a liberal allowance for repairs and maintenance of works.

It was my desire to get out a similar analysis of maintenance and repairs of mains and meters; but the practices already alluded to of unmercifully debiting revenue with meters for new consumers, precludes all possibility of arriving at a fair average from the balance-sheets. A bone of contention is still left, therefore, to the experts, even if 3½d. is accepted as a fair repair and maintenance of works rate.

Much could be said about rates and taxes. Most of us have looked with dismay upon the increasing amount under this head. With respect to the valuation of gas-works, the valuer of a neighbouring board of guardians told me in a patriarchal sort of way, that the best advice he could give to gas companies was to "lay low," for if they appealed against the valuation, ten to one it would be increased if the works were re-valued.

One phase of the income-tax business may be touched upon. While the Commissioners allow in private business a sum for depreciation, they insist—with us, at all events—upon charging income-tax upon all sums placed to depreciation in gas accounts. They certainly seem to be in possession of a good argument, in the assertion that gas companies are allowed, and expected, to maintain their works; and that if this is conscientiously done, there need be no depreciation. Acting on this advice, one company made certain that their meters did not depreciate by putting a sum of £200 for new meters to repairs of meters, instead of charging it to capital. Under other circumstances this sum would have been capitalized, and an equal amount carried to depreciation fund. Income-tax saved, £6 13s. 4d.

We will pass on to the receipts side of revenue. Slight improvements could be effected in many balance-sheets. Some companies having prepayment meters do not separate them from the ordinary sales; while others give the receipts for gas-rental, but do not state the price charged or the quantity of gas sold equivalent to the amount received. Discount, too, figures as a cost or item of expenditure in some accounts, though the most accurate method of treatment is to deduct it from the gross amount of gas-rental.

The following table will show how general the system of allowing discounts has become. The accounts of 68 undertakings were examined, out of which 16 do not sufficiently define whether discounts are allowed or not. Of the remaining 52, the figures are as follows:—

	Local Authorities.	Companies.
Allow discounts	21 ..	19
Do not allow discounts . .	7 ..	5
Total	28 ..	24

Therefore, out of 52 undertakings, no less than 40 allow discounts.

In the general balance-sheet or statement appear the sundry stocks of fittings, coals, &c. In this connection may be discussed the method of treating stoves on hire in the balance-sheet. Of 41 companies and corporations hiring out gas-cookers, 11 place the cookers to stock account, 24 place them to capital, and 6 charge the cost to revenue without taking credit for the expenditure in stock. In placing the cost to capital, some depreciate, and some do not. If an amount is not written off for depreciation periodically, the stoves can never stand at the full value at which they are capitalized after the first year. It may be suggested that, when one wears out, it would be replaced out of revenue; but still the bulk would be considerably less valuable than when first fixed and capitalized. Taken as stock, and depreciated by from 10 to 15 per cent., seems to me to be the most judicious way of treating them. Of 67 gas undertakings (companies and local authorities), 41 have the hired-stove system in operation, while 26 have not; showing a big majority in favour of this means of increasing the consumption of coal and water gas.

With many accounts, a working statement is incorporated; and if there is one thing that will put a manager on his best behaviour it is to find that someone else is producing results considerably better than his own. One or two comments on those accompanying the accounts sent in to me may not be altogether unacceptable. One return gave a make of just over 11,000 cubic feet to the ton. But this was destined to be left far behind; for the perusal of another statement revealed a make of 11.514 cubic feet, and still another 11,595 cubic feet per ton, of which no less than 11,112 cubic feet were sold. It would be interesting to know by what means such excellent results are obtained, and what is the proportion of cannel used. The cost per ton of coal and cannel works out to a fraction over 11s. 8d. One large works is able to show a leakage account of only 2·13 per cent. It should be stated that the works in question supply a level district, and therefore they do not labour under the disadvantages accruing from varying levels and pressures.

These are results that are not extracted from the realms of fancy, but appear in plain black and white in the working statements of gas undertakings. Hitherto most of us—in fact, nearly all of us—have had to be content with dreams of them; and if an allusion to them here should ultimately result, through discussion, in the dream spectres being materialized, these remarks will not have been made in vain.

The PRESIDENT said, as it was very late, Mr. Brearley had given his sanction to his paper being brought before the next meeting for discussion.

THE STANDARDIZING OF METER-UNIONS.

The PRESIDENT read the following letter which had been received from the Incorporated Gas Institute:—

> "Dear Sir,—I beg to inform you that at a meeting of the Council on the 8th inst., the following resolution was passed unanimously: 'That the Council consider it desirable that an application be made to the Board of Trade with the object of obtaining their recognition of a set of standards for meter-unions in the United Kingdom, but that before any action be taken a circular be issued to kindred Institutions and Associations asking for their views and co-operation in the matter.' Will you kindly take the earliest opportunity of placing the subject before your Executive, and let me know their decision? Yours truly, Walter T. Dunn."

It was the wish of the Committee to support the Institute in the application they proposed to make to the Board of Trade, and he, therefore, should be glad if the meeting would give their permission to this course being adopted.

The SECRETARY said it would be remembered that the question of the standardizing of gas-meter unions had been knocking about from pillar to post for some years. A paper was read on the subject at the meeting of The Gas Institute at Belfast, and it was then decided to leave the matter in the hands of the Council of the Institute. The Council were desirous of memorializing the Board of Trade to adopt a set of standards for meter-unions; but they first of all wanted to know what other kindred Institutions and Associations were prepared to do in the matter. He would, therefore, now propose: "That the Committee of this

Tables Referred to in Mr. Brearley's Paper.

TABLE A.—*Statutory Companies Selling Less than 30 Million Cubic Feet per Annum.*

No.	Gas Sold.	Amount Spent on Repairs and Maintenance of Works.	Rate per 1000 Cubic Feet of Gas Sold.
	Cubic Feet.	£ s. d.	d.
1	8,213,000	121 18 10	3·56
2	12,847,000	246 8 0	4·60
3	19,709,300	260 14 1	3·17
4	16,500,000	297 16 3	4·33
5	10,200,000	136 2 1	3·20
6	29,497,500	455 15 0	3·71
7	27,696,500	228 18 4	1·98
8	25,458,000	214 2 10	2 02
9	13,829,500	204 15 6	3·55
10	3,500,000	21 7 5	1·46
11	17,112,200	234 15 6	3·29
Totals .	184,563 000	2,422 13 10	..
Average of works	16,778.455	220 4 10	3·15

TABLE B.—*Statutory Companies Selling between 30 and 100 Million Cubic Feet per Annum.*

No.	Gas Sold.	Amount Spent on Repairs and Maintenance of Works.	Rate per 1000 Cubic Feet of Gas Sold.
	Cubic Feet.	£ s. d.	d.
1	52,661,000	1,407 9 9	6·41
2	43,752,000	751 1 7	4·12
3	71,688,400	1,205 5 8	4·03
4	85,744,800	1,101 9 6	3·08
5	42,091,900	1,185 12 11	6·73
6	46,300,000	1,199 19 11	6·22
7	50.398,700	990 16 9	4·72
8	98 869,000	1,262 3 7	3·30
9	46,122,700	423 16 0	2·20
10	32,678,000	420 13 1	3·09
11	63,185,200	1,286 2 2	4·88
12	53,208,000	1,255 13 0	5·66
13	36,300,000	253 15 10	1·67
14	70,000,000	913 3 1	3·13
15	63,500,000	381 15 3	1·42
Totals .	856,497,700	14,138 18 1	..
Average of works	57,099,847	942 11 10	3·96

TABLE C.—*Statutory Companies Selling over 100 Million Cubic Feet per Annum.*

No.	Gas Sold.	Amount Spent on Repairs and Maintenance of Works.	Rate per 1000 Cubic Feet of Gas Sold.
	Cubic Feet.	£ s. d.	d.
1	102,601,000	1,002 16 4	2·34
2	320 000,000	2,440 8 2	1·83
3	112,892,000	1,524 5 3	3·24
4	214.313,000	1,897 17 5	2·12
Totals. .	749,806,000	6,865 7 2	..
Average of works	187,451,500	1,716 6 9	2·19

SUMMARY.

No. of Companies.	Sale per Annum.	Total Annual Sale.	Amount Spent on Repairs and Maintenance of Works.	Rate per 1000 Cubic Feet of Gas Sold.
	Millions.	Cubic Feet.	£ s. d.	d.
11 (Table A)	Under 30 . . .	184,563 000	2,422 13 10	3·15
15 (Table B)	Between 30 & 100	856 497,700	14,138 18 1	3·96
4 (Table C)	Over 100 . . .	749,806,000	6,865 7 2	2·98
30 Totals .	..	1,790,866,700	23,426 19 1	..

Average rate of repairs and maintenance of works of 30 Companies of all sizes, per 1000 cubic feet of gas sold, 3·14d.

TABLE D.—*Local Authorities Selling Less than 30 Million Cubic Feet per Annum.*

No.	Gas Sold.	Amount Spent on Repairs and Maintenance of Works.	Rate per 1000 Cubic Feet of Gas Sold.
	Cubic Feet.	£ s. d.	d.
1	25,118,000	386 1 4	3·68
2	13,152,000	439 15 8	8·02
Totals .	38,270,000	825 17 0	..
Average of works	19,135,000	412 18 6	5·17

TABLE E.—*Local Authorities Selling between 30 and 100 Million Cubic Feet per Annum.*

No.	Gas Sold.	Amount Spent on Repairs and Maintenance of Works.	Rate per 1000 Cubic Feet of Gas Sold.
	Cubic Feet.	£ s. d.	d.
1	72,778,000	382 5 10	1·26
2	99,597,000	1,683 7 0	4·05
3	52,260,000	790 8 5	3 63
4	67,211,000	656 16 9	2·34
5	30,749,000	504 7 4	3·93
Totals. .	322,595,000	4,017 5 4	..
Average of works	64,519,000	803 9 1	2·98

TABLE F.—*Local Authorities Selling between 100 and 200 Million Cubic Feet per Annum.*

No.	Gas Sold.	Amount Spent on Repairs and Maintenance of Works.	Rate per 1000 Cubic Feet of Gas Sold.
	Cubic Feet.	£ s. d.	d.
1	128,626,300	3,233 0 8	6·03
2	146,065,000	896 13 5	1·47
3	103,604,000	1,235 13 10	2·86
4	139,86 ,000	1,481 12 4	2·54
5	157,916,600	1,762 8 2	2·67
6	130,000,000	3,036 5 11	5·60
7	114,929,700	1,115 3 9	2·32
8	105,511,000	1,627 8 3	3·70
9	137,312,600	649 18 11	1·13
10	176,213,000	1,277 6 7	1·75
Totals .	1,340,038,600	16,305 11 10	..
Average of works	134,003,860	1,630 11 2	2·92

TABLE G.—*Local Authorities Selling over 200 Million Cubic Feet per Annum.*

No.	Gas Sold.	Amount Spent on Repairs and Maintenance of Works.	Rate per 1000 Cubic Feet of Gas Sold.
	Cubic Feet.	£ s. d.	d.
1	309,354,400	1,564 13 2	1·21
2	358,914,000	6,268 16 6	4·19
3	256,932,000	1,670 7 3	1·56
4	527,553,000	4,509 3 0	2 05
5	1,588,000,000	28,261 10 11	4·27
6	1,036,009 000	9,030 17 4	2·08
7	519,780,000	7,817 0 9	3·60
8	260,000,000	8,268 1 6	7·63
Totals .	4,856,542,400	67,390 10 5	..
Average of works .	607,067,800	8,423 16 4	3·33

SUMMARY.

No. of Local Authorities.	Sale per Annum.	Total Annual Sale.	Amount Spent on Repairs and Maintenance of Works.	Rate per 1000 Cubic Feet of Gas Sold.
	Millions.	Cubic Feet.	£ s. d.	d.
2 (Table D)	Under 30 . . .	38,270,000	825 17 0	5·17
5 (Table E)	Between 30 & 100	322,595,000	4,017 5 4	2·98
10 (Table F)	Between 100 & 200	1,340,038,600	16,305 11 10	2·92
8 (Table G)	Over 200 . . .	4,856,542,400	67,390 10 5	3·33
25 Totals .	..	6,557,446,000	88,539 4 7	..

Average rate of repairs and maintenance of works of 25 Local Authorities of all sizes, per 1000 cubic feet sold, 3·24d.

Institution be empowered to support the Council of the Gas Institute in any action they might take in the matter of memorializing the Board of Trade with regard to obtaining a set of standards for meter-unions in the United Kingdom."

Mr. TOWNSEND seconded the resolution, which was passed unanimously.

Votes of Thanks.

Mr. G. E. Stevenson proposed that a hearty vote of thanks be accorded to the Corporation of Bradford for having so kindly permitted the members to visit the chemical works that day, and to Mr. Charles Wood, the Engineer, for having escorted them, and given them every opportunity of seeing the processes of manufacture of the various chemical products carried on there. Mr. T. N. Ritson, of Kendal, followed with a vote of thanks to Mr. Shadbolt for his "Notes on Purification," and to Mr. Brearley for his communication on the "Balance-Sheet." Mr. Townsend seconded the resolution; and it was supported by the Hon. Secretary, and passed unanimously. Mr. Brearley returned thanks, and this concluded the business of the meeting.

ACETYLENE.

By VIVIAN B. LEWES, F.I.C., F.C.S.,

Chief Superintending Gas Examiner to the Corporation of London, Professor of Chemistry at the Royal Naval College, Greenwich.

[The First of a Course of Cantor Lectures at the Society of Arts, delivered Nov. 21, 1898.]

At a meeting of the Royal Dublin Society, in March, 1836, Edmund Davy, who was at the time Professor of Chemistry to the Society, first described acetylene gas, and experimentally demonstrated some of its more remarkable properties, and in the autumn of the year, at the Bristol meeting of the British Association, read a paper upon it and the method of production—showing that when the metal potassium was made by heating a mixture of calcined tartar and charcoal in a large iron bottle, a black substance was frequently formed which was readily decomposed by water and yielded a gas which we now know as acetylene, but which he at that time christened bicarburet of hydrogen. It was in this paper that the author pointed out that from the brilliancy with which the new gas burnt in contact with the atmosphere, it was admirably adapted for the purpose of artificial light, if procured at a sufficiently cheap rate. Twenty years elapsed after Davy's discovery before any important addition was made to our knowledge of acetylene; and although Quet and Boettger made some observations on the formation of metallic acetylides in 1857, it was not until Berthelot's classical researches upon this compound, extending from 1859 to 1862, that anything was definitely known as to its true composition and method of formation. It was Berthelot who showed that acetylene was formed during the decomposition of many organic substances by heat, and that ethylene, methane, alcohol, and ether all yielded this compound when passed through heated tubes, and that it was therefore almost invariably found in the products of the destructive distillation of organic compounds; while he finally demonstrated the possibility of synthesizing acetylene by passing the electric current between carbon points in an atmosphere of hydrogen.

Acetylene has shared with many other bodies the troubles incidental to the constant changes of nomenclature which have occurred during the past century. Christened bicarburet of hydrogen by its discoverer, it soon became known as klumene; while at a much later date the name acetylene was bestowed upon it, being derived from the hypothetical radical acetyle (C_2H_3), to which acetylene bears the same relationship as ethylene (C_2H_4) does to the radical ethyle (C_2H_5). It was also proposed at one time to call it ethine; but the name which has survived the diseases common to incipient nomenclature is that of acetylene, by which it is now universally known. On analysis, this gas is found to contain—

Carbon	92·3
Hydrogen	7·7
	100·0

It has a density of ·92. When prepared by the action of water upon calcic carbide, it has a very strong and penetrating odour; but when the gas is thoroughly purified from sulphuretted and phosphuretted hydrogen—which are invariably present with it in minute traces—this extremely pungent odour disappears, and the pure acetylene has a not unpleasant etherial smell.

Acetylene is readily soluble in water, which at normal temperature and pressure takes up a little more than its own volume of the gas, and yields a solution giving a purple red precipitate with ammoniacal cuprous chloride, and a white precipitate with silver nitrate—these precipitates consisting of acetylides of the metals. The solubility of the gas in various liquids, as given by different observers, is—

100 Volumes of		Volumes of Acetylene.
Brine	absorb	5
Water	,,	110
Alcohol	,,	600
Paraffin	,,	150
Carbon disulphide	,,	100
Fusel oil	,,	100
Benzene	,,	400
Chloroform	,,	400
Acetic acid	,,	600
Acetone	,,	3100

It will be seen from this table that, where it is desired to collect and keep acetylene over a liquid, brine—*i.e.*, water saturated with salt—is the best for the purpose; but in practice, it is found that unless water is agitated with acetylene, or the gas bubbled through water, the top layer soon gets saturated, and the gas then dissolves but slowly.

The great solubility of acetylene in acetone was pointed out by MM. Claude and Hess, who suggested charging acetone with the gas under pressure; a litre of acetone dissolving 360 times its own volume of the gas under a pressure of 12 atmospheres. On relieving the pressure, the gas again escapes, and it was thought that this would prove a better method of storing the gas than liquefying it; but experiment has shown that acetone saturated in this way under pressure shares many of the disadvantages of liquid acetylene itself.

When acetylene was first introduced on a commercial scale, grave fears were entertained as to its safety. It was represented that it had the power of combining with certain metals—more especially copper and silver—to form acetylides of a highly explosive character. If acetylene be passed through an ammoniacal solution of cuprous chloride, copper acetylide is formed; and when dry this explodes with great violence when struck or when heated. Even with coal gas, which contains less than 1 per cent. of acetylene, such copper compounds have been known to be formed in cases where the gas distributing mains were composed of copper; and some accidents have happened from this cause. It was therefore predicted that the introduction of acetylene on a large scale would be followed by numerous accidents, unless copper and its alloys were rigidly excluded from contact with the gas. These fears, however, have fortunately proved to be absolutely unfounded; and the original gas-fittings can be used with perfect safety for this gas.

In the summer of 1895, Mr. H. Gerdes, the Chief Engineer of Messrs. Pintsch, of Berlin, made an exhaustive series of experiments upon this point, not only with the gas under ordinary pressure, but with mixtures of acetylene with oil and coal gas at pressures of nearly 10 atmospheres. This was done by placing the metals to be tested in steel cylinders; the slips being fitted in wooden frames so arranged as to prevent any contact either between the individual metals or the walls of the metal cylinder. Two of these cylinders were filled with pure acetylene, two with a mixture of 80 per cent. of acetylene and 20 per cent. of oil gas, and one with a mixture of acetylene with 20 per cent. of coal gas; a small quantity of water being placed in each cylinder in order that the gas should be moist, as it was expected that this would greatly facilitate the action upon the metals. These cylinders were filled with the gases at a pressure of 9 to 10 atmospheres; and they were exposed on the roof of a shed from July 18, 1895, to April 9, 1896—this range of time exposing them to the highest temperature of an exceptionally hot summer and the lowering of temperature incidental to a very cold winter. Of all the metals and alloys used, the ones which are known to resist ordinary oxidation in the air remained perfectly unaffected, while the easily oxidizable metals suffered on the surface; but in no instance was it possible to trace any acetylene compound, and no explosion could be produced by either heating or hammering. Further experiments with acetylene, ammonia, and water showed clearly that such corrosion as had taken place by the simultaneous action of ammonia gas and acetylene was due exclusively to the action of the former gas, and no explosive compounds were formed.

Independent observations by M. Bullier at about the same period showed that, in order to obtain this explosive compound of acetylene and copper, it was necessary that the gas should come in contact with a sub-salt of the metal in the presence of excess of ammonia; and as in actual practice these conditions would never be realized, it is manifest that the alleged danger may be disregarded.

Acetylene shows some extremely interesting actions with regard to other metals. If it be passed over red-hot sodium or potassium, these metals burn in the gas with the formation of carbides which, on being brought into contact with water, decompose with explosive violence, again setting acetylene free. Moissan and Mourreu have made the interesting observation that with certain metals in the spongy condition, strong action takes place with acetylene, and that if this gas be passed over reduced iron which has been prepared at as low a temperature as possible, bright incandescence is produced, and carbon is copiously deposited and quickly chokes the tube, hydrogen at the same time appearing as a gaseous residue.

The second drawback that has always been urged against acetylene in its early days was that it was a highly poisonous gas; the researches of Bistrow and Liebreich having apparently shown that it acted upon the blood, in the same way that carbon monoxide did to form a stable compound. Experiments upon the toxic action of gases, however, are open to considerable error, partly depending upon the method by which the gas has been prepared and which will affect its purity, and partly upon the nature of the animals upon which the experiments are tried. Rabbits and other rodents resist the action of gaseous poisons like carbon monoxide far better than carnivorous animals such as dogs; and it is impossible to argue from the action of the gas upon the one what the action will be upon the other, while it has not yet been made clear that the action upon either is a very safe index to the action of the gas upon man. Very extensive experiments, however, made by Dr. Gréhant, Brociner, Malooz, Crismer, and others, conclusively show that acetylene is much less toxic than carbon monoxide, and, indeed, than coal gas.

Acetylene gas can be condensed into the liquid state by cold or by pressure; and the experiments by Ansell show that if the gas be subjected to a pressure of 21·53 atmospheres at a temperature of 0° C., it is converted into the liquid state—the pressure needed increasing, of course, with the rise of temperature, and decreasing with the lowering of the temperature, until at − 82° C. acetylene becomes liquid under ordinary atmospheric pressure. The critical point of the gas is 37° C., at which temperature it requires a pressure of 68 atmospheres to liquefy it; while immediately this temperature is passed, no pressure that could be brought to bear upon it will convert it into the liquid state. This phenomenon, which is common to all gases, of resisting all efforts to liquefy them above a certain temperature, was first investigated by Andrews; and the resolution of liquid acetylene into a gas on reaching its critical point can be very beautifully illustrated by taking a small tube half filled with the

liquid, and projecting an image of it upon the screen. On now gently warming the tube, the meniscus of the liquid, which at first was perfectly clear, is seen to flatten itself, and in a few minutes to entirely disappear as the temperature passes the critical point. On removing the source of heat, and allowing the tube to cool, as soon as the critical point is again reached on the downward scale, a violent storm of acetylene rain is seen to be going on in the tube, as the gas condenses to the liquid state once more.

Long before the discovery by Willson of the method of making calcic carbide on a commercial scale had placed acetylene at every experimentalist's disposal, acetylene had been liquefied by Cailletet, Andrews, and Ansell. But with the advent of calcic carbide, liquid acetylene assumed a position of commercial importance; and Messrs. Dickerson and Suckert, seeing the business possibilities, made it on a fairly large scale, and kept it in steel cylinders, while some time afterwards Pictet also set up the manufacture of the liquid. A great future was expected from its use in this condition, as a cylinder fitted with the necessary reducing valves would supply the gas to light a house for a considerable period; the liquid occupying between $\frac{1}{300}$ to $\frac{1}{500}$ the volume of the gas. But in the States and on the Continent, where liquefied acetylene was made on a large scale, several fatal accidents occurred owing to its explosion under not easily explained conditions.

As a result of these explosions, Berthelot and Vieille made a very valuable research upon the explosion of acetylene under various conditions; and they found that, if liquid acetylene in a steel bottle is heated at one point by a platinum wire raised to red heat, the whole mass decomposes and gives rise to such tremendous pressures that no cylinder would be able to withstand them. These pressures vary from 71,000 to 100,000 lbs. per square inch. They moreover tried the effect of shock upon the liquid, and found that the repeated dropping of the cylinder from a height of nearly 20 feet upon a large steel anvil gave no explosion; but that when the cylinder was crushed under a heavy blow, the impact was followed after a short interval of time by an explosion. This, however, was manifestly due to the fracture of the cylinder and ignition of the escaping gas mixed with air from sparks caused by the breaking of the metal; and a similar explosion will frequently follow the breaking in the same way of a cylinder charged with hydrogen at a high pressure. Continuing these experiments, they found that in acetylene gas under ordinary pressures the decomposition brought about in one portion of the gas, either by heat or the firing in it of a small detonator, did not spread far beyond the point at which the decomposition started, but was local; while if the acetylene was compressed to a pressure of more than 30 lbs. on the square inch, the decomposition travelled throughout the mass, and became in reality detonation.

These results showed clearly that liquefied acetylene was far too dangerous for general introduction for domestic purposes, as although the occasions would be rare in which the requisite temperature to bring about detonation would be reached, still if this point were attained, the results would be of a most disastrous character; while the fact that several accidents had already happened, accentuated the risk. In this country, the storage and use of liquefied acetylene is prohibited. When liquefied acetylene is allowed to escape from the cylinder in which it is contained into ordinary atmospheric pressure, some of the liquid assumes the gaseous condition with such rapidity as to cool the remainder below the temperature of 90° C., and converts it into a solid snow-like mass.

Acetylene has the property of inflaming spontaneously when brought into contact with chlorine. If a few pieces of carbide be dropped into saturated chlorine water, the bubbles of gas as they reach the surface spontaneously catch fire; while if a jet of acetylene be passed up into a bottle of chlorine, it takes fire and burns with a heavy red flame, depositing its carbon in the form of soot. If chlorine be bubbled up into a jar of acetylene standing over water, a violent explosion, attended with a flash of intense light, and the deposition of carbon at once takes place. When acetylene is kept in a small glass holder exposed to direct sunlight, the surface of the glass soon becomes dimmed; and Mr. Bone has shown that when acetylene is exposed for some time to the sun's rays, it undergoes certain polymerization changes which lead to the deposition of a film of heavy hydrocarbons on the surface of the tube. It has also been observed by Cailletet, and later by Villard, that when allowed to stand in the presence of water a solid hydrate is soon formed.

Acetylene, as has been shown, is readily decomposed by heat; polymerizing under its influence to form an enormous number of organic compounds. Indeed, acetylene, which can itself be directly prepared from its constituents—carbon and hydrogen—under the influence of the electric arc, can thus really be made the starting point for the construction of an enormous number of different organic compounds of a complex character. Acetylene in contact with nascent hydrogen builds up ethylene; ethylene acted upon by sulphuric acid yields sulphovinic acid; and this can again be decomposed in the presence of water to yield alcohol, while it has even been proposed to manufacture sugar from this remarkable body. Picric acid also can be obtained from it, by first treating acetylene with sulphuric acid, converting this into phenol by dissolving in potash, and then treating the phenol with fuming nitric acid.

Acetylene is one of those bodies the formation of which is attended with the disappearance of heat; and it is for this reason termed an endothermic compound, in contra-distinction to those bodies which evolve heat in their formation, and which are called exothermic. Such endothermic bodies are nearly always found to show considerable violence in their decomposition, as the heat of formation stored up within them is liberated as sensible heat; and it is undoubtedly this property of acetylene gas which leads to its easy detonation by either heat or a shock from an explosion of fulminating mercury when in contact with it while under pressure. The observation that acetylene would be resolved into its constituents by detonation is due to Berthelot, who by starting an explosive wave in acetylene by firing in it a charge of 0·1 gramme of mercuric fulminate, succeeded in doing this. It has since been shown, however, that unless the gas is at a pressure of more than 2 atmospheres this wave soon dies out and the decomposition is only propagated a few inches from the detonator.

If acetylene be heated in contact with air to a temperature of 480° C., it ignites and burns with a flame the appearance of which varies with the way in which the acetylene is brought in contact with the air. With the gas in excess, a heavy lurid flame emitting dense volumes of smoke results; while if the gas be driven out in a sufficiently thin sheet, it burns with a flame of intense brilliancy and almost perfect whiteness, by the light of which colours can be judged as well as by daylight. The ignition point of the gas being below that of ordinary gas, it can be ignited by any red hot carbonaceous matter, such as the brightly glowing end of a cigar.

For its complete combustion, 1 volume of acetylene needs 12½ volumes of air, and forms as its products of combustion carbon dioxide and water vapour. When, however, the air is present in much smaller ratio, incomplete combustion ensues, and carbon, carbon monoxide, carbon dioxide, hydrogen, and water vapour are produced. This is well shown by taking a cylinder one-half full of acetylene and one-half of air. On applying a light to this mixture, a lurid flame runs down the cylinder and a cloud of soot is thrown up; the cylinder also being thickly coated with it, and often containing a ball of carbon. On waiting a few moments to allow some air to diffuse into the cylinder, and again applying a taper, an explosion, due to a mixture of carbon monoxide and air, takes place. It is probable that when a flame is smoking badly, distinct traces of carbon monoxide are being produced; but when an acetylene flame burns properly, the products are as harmless as those of coal gas, and light for light very much less in amount.

When acetylene is mixed with air, like every other combustible gas it forms an explosive mixture. Observers differ somewhat as to the range between which mixtures of acetylene and air are explosive. Dr. Clowes states that any mixture containing from 3 to 82 per cent. of the gas is explosive; while Dr. Bunte gives from 3·8 to 40 per cent. as the explosive limit for the mixture. These discrepancies are probably due to differences in the method of igniting the mixture, and also as to what is to be taken as an explosion. A light applied to a mixture containing 3 or 80 per cent. of acetylene will propagate combustion throughout the mass, but so slowly under all ordinary conditions as not to attain to the dignity of an explosion; and for all practical purposes the explosive limit may be taken as 3·5 per cent. of acetylene, the upper limit being of no importance, as so large a volume of the gas is never likely to be present in the air. An explosive mixture of acetylene and air attains its maximum power with a mixture of 12·5 volumes of air to 1 of acetylene; while ordinary coal gas forms explosive mixtures between the limits of 6 and 29 per cent., and yields its maximum result with a mixture of 1 volume of coal gas to about 10 volumes of air.

The methods which could be, and have been, employed from time to time for the formation of acetylene in small quantities are excessively numerous; but before the commercial production of calcic carbide made acetylene one of the most easily obtainable gases, the methods which were most largely adopted for its preparation in laboratories were: First, the decomposition of ethylene bromide by dropping it slowly into a boiling solution of alcoholic potash, and purifying the evolved gas from the volatile bromethylene by washing it through a second flask containing a boiling solution of alcoholic potash, or by passing it over moderately heated soda lime; and, secondly, the more ordinarily adopted process of passing the products of incomplete combustion from a bunsen burner, the flame of which had struck back, through an ammoniacal solution of cuprous chloride, when the red acetylide of copper was produced, and this on washing and decomposing with hydrochloric acid yielded a stream of acetylene gas. This second method of its production, which was the one most usually adopted, has, however, the great drawback that, unless proper precautions are taken to purify the gas obtained from the copper acetylide, it is always contaminated with certain chlorine derivatives of acetylene.

In the years 1890 and 1891, I devoted much time to trying to ascertain the various actions which take place in coal-gas flames, and which lead to their luminosity. The classical researches of Sir Humphry Davy first clearly showed that luminosity was due to particles of solid carbon heated to incandescence within the luminous zone; and my endeavour was to find the causes which led to the setting free of these solid particles. The gas which is supplied to us for illuminating purposes—whether it be coal gas, carburetted water gas, or oil gas—consists of a mixture of many

gaseous bodies, of which hydrogen, carbon monoxide, and members of the methane and ethylene families form the largest proportion; while a small percentage is composed of gases—such as carbon dioxide, oxygen, and nitrogen—which are simply impurities.

When the homogeneous mixture of these varied constituents leaves the burner-tip, and the gases find themselves in the presence of the atmosphere, they at once begin to diffuse into it with a rapidity inversely proportional to the square roots of their densities, with the result that the lightest and most abundant member of the gas mixture, hydrogen, finds its way quickly to the exterior, and methane soon follows. These two gases, constituting some 85 per cent. of the mixture, on meeting the air bear the brunt of the combustion, and in burning form the main portion of the sheath of complete combustion surrounding the lower part of the flame. The heavier constituents of the coal gas are naturally those least affected by diffusion; and the desertion of the hydrogen and methane concentrates them in the centre of the flame, and they flow upwards, forming the non-luminous inner zone of the flame, or, as it is more often termed, the zone of non-combustion. These gases are chiefly the unsaturated and heavier members of the saturated hydrocarbons present in the coal gas; and in their upward travel the baking action of the heat from the completed combustion going on in the outer envelope of the flame, causes a resolution of the more complex hydrocarbon molecules into the simpler compounds acetylene and methane. As these in turn diffuse outwards, they reach the outer wall of combustion, which is undoubtedly the hottest part of the flame; and just below the inner side of the outer zone, the acetylene, heated to above its temperature of decomposition, instantaneously splits up into finely divided carbon and hydrogen, and the heat liberated by the decomposition and by the change of state of the carbon, being localized by the rapidity of the action to the solid particles, so augments the temperature given to them by the flame, that they glow with high incandescence, and form the luminous sheath which caps the inner zone of non-combustion.

Experiments made by withdrawing the gases from various parts of luminous flames, showed that no matter what was the initial character of the hydrocarbon present, acetylene was always produced before luminosity made its appearance; and, moreover, that the illuminating power of the flame followed the ratio of acetylene so produced. This fact, taken in conjunction with the observation that when acetylene free from air is allowed to flow through a Jena glass tube heated up to a temperature of 780° C. it is decomposed with luminosity; while the carbon set free in flowing forward through the zone of heat is perfectly non-luminous, formed the basis of what is now known as the acetylene theory of luminosity.

Stated in its simplest form, this theory is as follows: In the same way that the decomposition of the acetylene in flowing through a heated tube endows the carbon particles with a luminosity which the heat of the tube alone is unable to impart, so does the decomposition of the acetylene generated in a hydrocarbon flame increase the light-yielding power of the carbon particles liberated by its decomposition over what might have been the light emitted had they only been heated to the temperature of the flame itself. When it is considered what an enormous difference is produced by a few degrees of temperature in the light-emitting power of solids heated in a flame, it at once becomes manifest that it is at least injudicious for opponents of this theory to sneer at the effect likely to be produced by such increase in temperature as is given rise to by the decomposition of acetylene. It is perfectly well known to everyone interested in the methods employed for burning coal gas, that regeneration increases the light emitted by a flame over 100 per cent., and in some cases three times this amount; and yet the increase in the temperature of the flame due to warming the gas and air before combustion is but a small one.

I freely admit that, when I first brought this theory forward in 1895, I placed too much dependence upon the measurements of flame temperatures by the methods at our disposal for such investigations; and in so doing, I laid the theory open to attack—an opportunity that was taken full advantage of. But in spite of all the criticism which has been bestowed upon it, the main issue has never been shaken; and I am as fully convinced now as I was then that in all luminous hydrocarbon flames acetylene may be truly looked upon as "the mother of the luminosity."

There are conditions under which acetylene can be burnt without the development of light. If acetylene be diluted with about 92 per cent. of hydrogen or carbon monoxide, the molecules are burnt up without decomposition; and there being no solid matter in the flame to heat to incandescence, the flame remains non-luminous. This is due to the acetylene requiring a higher temperature to decompose it when it is diluted than when it is pure; and the greater the dilution, the higher the temperature needed.

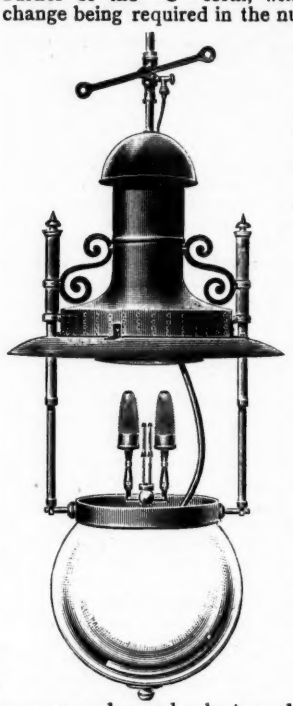
If burning alcohol, which in the open air gives a faintly luminous flame, be placed under a bell jar, the temperature of the flame is lowered by some of the products of combustion being checked in their escape, and the flame becomes absolutely non-luminous. If now oxygen be supplied to the flame, its temperature becomes greatly increased, and not only does the flame become highly luminous, but freely deposits carbon on a cold surface held within it; while gas withdrawn from the interior of the flame under each condition is found to contain acetylene.

Another very striking example of the same kind is to be found in cyanogen—a gas which has always been noted for the beauty of the rose-pink flame with which it burns. Though cyanogen contains the same amount of carbon as acetylene, and is even more endothermic, no one until lately had ever thought of the possibility of its burning with a luminous flame; this being due to the fact that the temperature necessary to break up the molecule was so far above the heat of the flame that the cyanogen molecule burnt as a whole, and there being no deposition of carbon no luminosity would result. If, however, the cyanogen flame be surrounded with pure oxygen instead of air, a faint luminosity appears in the flame owing to the increase of temperature; while if the flame be surrounded by nitrogen dioxide—another endothermic compound—the temperature is so increased that the flame becomes more intense in its illuminating power than the acetylene flame itself, and yields a dense deposit of carbon and paracyanogen to any cold surface held within it.

[The lecture was illustrated by several brilliant experiments.]

THE "BEACON" GLOBE LAMP.

The new lamp which we here illustrate, and which has been appropriately named the "Beacon," appears to possess several points which will commend it for use with the incandescent gas system. It is the invention of Mr. H. Talbot, and is being placed on the market by Messrs. H. Greene and Sons, Limited, of 19, Farringdon Road. It can be readily fitted for one, two, or three burners; and is equally suitable for the new Welsbach burner or the "C" form, with chimney. In the event of a change being required in the number of burners used, it can be accomplished by simply removing the existing fitting on the supply-pipe of the lamp and screwing on a new piece with the necessary arms. The bye-pass tube is arranged inside the gas-supply pipe; so that only one pipe is visible inside the lamp. The construction of the top of the body of the lamp renders it entirely wind and weather proof. The cold air passes through a separate chamber, and descends over a cone, which acts as a shield to the burners, and assists in warming the air before it reaches the mantles. This is a decided advantage, especially with the new incandescent burner. When the lamp is intended for use in shops or sheltered places, provision has also been made for the admission of air in the bottom of the globe; and the inflow can be adjusted according to requirements. For obtaining access to the interior of the globe for cleaning purposes and renewal of mantles, the inventor has applied a simple but ingenious arrangement. The globe is let down on runners, and can also be turned up to an angle on its bearings, The lamp is only being made in one size; so that all parts are interchangeable. While it is substantially built, the demand for an ornamental appearance has not been overlooked by its designer.



The Value of the Calorie.—A correspondent of "Engineering" points out that in works on physics the calorie is the amount of heat required to raise the temperature of 1 gramme of water from a temperature of 4° to that of 5°C.; its value being thus 0·00396 British thermal units. In works on the steam-engine, and similar manuals, showing both French and English, the calorie is generally taken as the amount of heat required to raise 1 kilogramme of water 1° C.; its value being thus equal to 3·96 British thermal units—a value 1000 times greater than that first named. He wishes to be informed as to what means are taken in French practice to avoid confusion between these two values of a calorie.

The Effect of Wall Colouring on Illumination.—Reflection plays a very important part in the illumination of rooms; and the proportion of the light which falls on the walls which is reflected by them, depends on their colour and substance. Experiments recently made for the purpose of determining the extent to which walls of various colours reflected light falling upon them, are reported by "Der Gastechniker" to have given the following figures for the reflected light, in percentages of the total light: Black velvet surface, 0·4; black cloth, 1·2; black paper, 4·5; dark blue, 6·5; dark green, 10·1; bright red, 16·2; dark yellow, 20; blue, 30; bright yellow, 40; bright green, 46·5; bright orange, 54·8; white, 70; and mirrors, 92·3.

CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

Carburation of Coal Gas.

Sir,—I was very pleased indeed to notice in your issue of Nov. 22 that Mr. William Young had, in your "Correspondence" columns, lent his valuable aid to the discussion of the above subject. With reference to the question of temperature and the formation of naphthalene deposits, the main influence in this connection is undoubtedly, as mentioned by Mr. J. W. Helps, the extremes of temperature between the night and the day. Regarding, however, the most interesting theories put forward by Mr. Young, like many other gentlemen who have not seen the apparatus at work, I fear he is under misapprehension as to the part the compressed gas plays in the process; and I would therefore say, with the desire of making this perfectly clear, that only a small amount of gas (about 100 cubic feet or so per hour) is compressed in connection with the production of the oil mist. The temperature of this compressed gas, when used at the atomizers, is precisely the same as the gas in the carburater and the town mains, and therefore cannot affect the question.

In view of the above explanation, Mr. Young will doubtless look into the matter again; and that I may assist him, I would add that the process does not deteriorate the illuminating power of the gas. On the contrary, as has already been pointed out several times, it has been noted that at the extremes of our district it is better maintained than formerly was the case. Also the syphons outside the works are only pumped once a month—following our custom here for many years past. The amount of condensation, which is partly of oil and partly of water, is slightly more than formerly; but in view of the very greatly increased output of gas, this, of course, is only to be expected. There is, undoubtedly, naphthalene in solution in the liquid found in the syphons about the town. But it is not of the quantity the theory advanced by Mr. Young would imply; the oil used having but slight solvent properties.

The oil which collects in the drip-well of the carburater itself, is used over and over again, until its specific gravity has reached about ·845 to ·850; and it does not contain naphthalene. The syphons of the town mains, *within the area of the works*, contain oil and water in widely varying proportions; but, again, this oil is nearly always quite free from naphthalene, and after separation is used in the water-gas plant, unless its specific gravity renders it suitable for use again in the carburater. There is also absolute proof that the carburated gas retains, and to a degree absorbs (when present in the mains), naphthalene right up to the burner. Mr. Young suggests that oil may be found in the consumers' fittings, but this is not so in the ordinary way, and has not given any trouble. Besides, the quantity used is so minute.

I look forward to Mr. Young's further contribution on the subject with great interest.

Hastings, Nov. 25, 1898. Chas. E. Botley.

Prepayment Meters.

Sir,—The interesting article by Mr. E. W. T. Richmond would be more so if some inaccuracies were corrected. Wallace's patent was not twelve months prior to Brownhill's, but in the same year; the one being dated Feb. 1, 1887, and the other May 13, 1887. In his provisional specification, Wallace made no mention of supplying gas at all; his invention being one for the delivery of articles of an undefined character, but which the description shows cannot be gas. The proposed delivery of fluids is not mentioned until his complete specification, which was lodged on Dec. 1, 1887. In the meantime, Brownhill had applied for his patent under the specific title of "An Improved Gas-Meter for Supplying Gas in Exchange for Coin or an Equivalent," and this evidently gave Wallace the inspiration as to gas.

I also notice that Mr. Richmond goes out of his way to speak of Mr. Price's invention as "one of the few master patents." He ought to know that there can only be one master patent in any class; and, if such a thing exists (as I believe it does), it is not Price's, which was No. 15,410 of 1887, but its predecessor Brownhill's, No. 7620 of 1887. Further, so far as I am aware, Price's meter never came into extensive use; and Mr. Richmond forbears to mention the first attachment which was largely employed—viz., that of Thorp and Marsh, No. 7233 of 1889, made by Messrs. Sawer and Purves. This is the one which was fixed in Liverpool, and which proved to be an operative success.

I would not have troubled you with this letter were it not that Mr. Richmond is in some sense making history, and it is as well the facts should be accurately stated.

Manchester, Nov. 21, 1898. Joseph Nasmith.

Tramway Traction.

Sir,—In view of Mr. J. Allen Baker's report on the above subject, and his recent communication to the Press thereon, I should like, with your permission, to make a few remarks on the question.

As pointed out in your second article on "Mechanical Tramway Traction," Mr. Baker, as well as other electrical engineers, entirely shirks the question of gas traction, although no electrical system whatever can show the cost of energy to be so low as that of the gas-motors at Blackpool, where 0·92d. is the cost of the power to run a car one mile. Some of the electrical papers have dealt with the question of gas cars facetiously, being apparently unable to controvert the figures put forward in support of their economical working. Banter is not argument; and some of these would-be wiseacres seem to think this method of tramway propulsion is at a standstill—that no advance whatever has been made in connection with its mechanism, and that no improvements have been introduced. Whole installations of electrical apparatus may be scrapped to make room for more modern ideas or better machinery, as has been done in America; but this is not taken as indicating a weakness on the part of the electrical industries, but rather as a proof that the goal of perfection is being reached. The same consideration, however, is not shown in the case of the gas cars; the argument used being: It was bad once; it cannot be good now. In the early days of gas traction, difficulties had to be met, and occasionally objectionable features cropped up; but some of those who witnessed the trials at that time have these disadvantages still in their minds, and cannot yet get the idea of smell removed from their memories. They therefore continue to condemn in the cars what does not now exist. Both smell and vibration are entirely eradicated—the one by the introduction of special lubricating arrangements, and the other by a simple process of balancing; and as cars every day and all day ascend at Blackpool gradients of 1 in 26, and at the same time go round a curve of 30 feet radius, it cannot logically be affirmed that the system is by any means out of the running.

In the "New York Herald" of the 27th of October, there is a report of a paper given by Mr. A. A. Kundson before the American Institute of Electrical Engineers; and the following extracts prove, even after so many years of American experience of electrical traction, that the question of electrolytic action is still a pertinent and ever-present one, although electrical partisans on this side would have us believe otherwise: "He started out by quoting the report of E. E. Brownell, a civil engineer who was employed to examine the water-mains of Dayton (Ohio). 'To my surprise I have found in this city a 6-inch water-main that was corroded to the depth of ¼-inch.' Subterraneous New York is honeycombed with wild cat electric currents that are playing havoc with water and gas pipes, and endangering the foundations of the 'L' structure. This startling revelation was made last night to the members of the American Institute of Electrical Engineers by A. A. Kundson. . . . By leakage in Harlem. . . . the electrolysis where the current left the rails was so great at this point that the Company was recently obliged to lay new rails." There is more; but the above is a sufficiently striking commentary on Mr. Baker's deductions in favour of electricity.

It will be easier to deal with the merits of the three systems if I tabulate the disadvantages and advantages of each. To my mind, the main disadvantages of the electrical systems are—

Conduit.

1.—Excessive initial cost. In some cases, £20,000 was expended on a mile of single track, and £15,000 on one junction *alone*.
2.—Danger of slot to vehicular traffic.
3.—Filling of slot with water, slush, or snow. Our climate is too humid; and the system at Blackpool has been stopped for hours, and Berlin has had a similar experience, through the snow filling the troughs.
4.—High working costs. In view of different rates of speed, 5d. cannot seriously be taken as a criterion of English experience, with the Board of Trade limit of eight miles per hour.
5.—Cars not self-contained.

Trolley.

1.—Heavy capital expenditure.
2.—Cars not self-contained.
3.—Trolley wires dangerous. Even on a new installation on the Springburn route at Glasgow, a trolley wire broke with a vivid flash, and alarmed the passengers. Other examples can readily be recalled by your readers.
4.—Dangers of electrolysis. Either take American experience or digest the expert evidence given at the late British Association meeting; both corroborate the destructiveness of electrical currents.
5.—Cost for energy high. Taking 0·95 of a unit as being necessary to propel a car a mile, the cost for power can easily be calculated from the statistics given in "Lightning" week by week. The average rate is about 4d. per unit, although in some cases it is less; but in Edinburgh, where the cost of production is cheapest, the actual cost is 1·2d., and the selling price for power 2d.

From this it can safely be inferred that most corporations adopting the trolley would find their electricity bills too heavy to be either comfortable or profitable.

These are sufficient arguments to induce the "powers that be" to hesitate before committing their ratepayers to any electrical installation.

Mr. Hersey, in his letter (*ante*, p. 976), gave ample proof that gas traction was quite capable of holding its own in the field of tramway enterprise; but it may be useful to set out again the main reasons why gas-motor cars are so admirably suited for tramways. They are as follows:—

1.—Low capital expenditure. The cost of compressing plant for, say, twenty cars would only be about £2000—an infinitesimal sum compared with that required to instal electric cars.
2.—The cars are self-contained. There is no chance of disorganizing the system should a car break down.
3.—Energy to run a car-mile costs only 0·92d.
4.—Cars can run on any well-laid line.
5.—System can be gradually adopted, and gas-motor cars can run in general traffic with horse cars, either as an experiment or until the time is ripe for a complete organization.

In your excellent articles, you are bringing forward strong arguments which it will be difficult for our electrical friends to controvert, and are giving the gas-motor industry a fillip for which the thanks of all those interested in gas undertakings will be gratefully given. Whatever gas traction may have been in its initial stages, the gas-motor cars of to-day will compare favourably with those of any other system, more particularly as those in use at Blackpool will shortly be brilliantly lighted with incandescent mantles; and if the Company are given an opportunity of demonstrating their merits and advantages of their system on the London tram-lines, electric partisans will find that the gas-motors cannot be swept out of the tramway field by a sneer, or utterly demolished by a hoary-headed jokelet.

London, Nov. 17, 1898. A Believer in Gas-Trams.

A New Retort-House at Spalding.—Alderman Mills, the Chairman of the Gas Committee of the Spalding District Council, opened a new retort-house at the gas-works last Thursday. The building, which has been constructed to accommodate twelve beds of retorts, has cost upwards of £3000. The gas-works during recent years have been very profitable. They are free from debt, the price of gas has been reduced to 2s. 6d. per 1000 cubic feet, and the public lighting done at a nominal cost.

PARLIAMENTARY INTELLIGENCE.

NOTICES GIVEN FOR BILLS (SESSION 1899) RELATING TO GAS AND WATER SUPPLY AND ELECTRIC LIGHTING.

Airdrie and Coatbridge Water.—Permission will be sought by the Airdrie and Coatbridge Water Company to abandon a reservoir and certain incidental works authorized by their Amendment Act of 1892, and construct new works comprising a reservoir in the parish of Lamington and Wandel, in Lanarkshire, and an aqueduct or pipe-line. Additional capital will be required.

Arbroath Corporation Gas.—Application will be made by the Corporation of Arbroath for authority to borrow additional money for the purposes of their gas undertaking, and to alter and define the rights and privileges of creditors. It is proposed to amend the Corporation's Act of 1871 with reference to the quality and illuminating power of the gas supplied, and reduce the number of candles prescribed, and make further provision with respect to the quality, lighting power and pressure, and testing of the gas; also to amend section 47 of that Act, limiting the standard price charged for gas consumed by meter, and make all necessary provisions for altering the rates for gas, meters, and residual products so that the yearly income to be derived therefrom shall, as nearly as may be, meet the expenditure for each year, including annuities, interest, and sinking fund. Provision will be made for the application of the revenues to the formation of a contingent, reserve, depreciation, renewal, or other fund in connection with the undertaking.

Ayr Burgh.—The Corporation of Ayr intend to apply for power to construct new water-works, comprising a service reservoir, a pumping-station, and three pipe-lines, together with a road giving access to the pumping-station. Further borrowing powers will be applied for.

Barking Improvement.—The Barking Urban District Council purpose applying, among other things, for authority to purchase the undertaking of the Barking Gas Company, improve and extend the works, and supply gas, meters, fittings, &c., as well as electric wires, fuses, and fittings, in their district. The necessary money powers will be required.

Barton-on-Sea Water.—Authority will be sought for the incorporation of a company for the purpose of constructing works to supply water within the parishes of Highcliffe, Milton, Hordle, Milford, Sway, Brockenhurst, Boldre, and Lymington, the township or parish of Rhinefield, and the borough of Lymington, all in the county of Southampton, or in one or more of these places. The works will consist of a well, pumping-station, and service reservoir in the parish of Milton, and two conduits or pipe-lines. The usual powers of water companies will be applied for.

Belfast Corporation.—In a General Bill to be promoted by the Corporation of Belfast, authority will be sought to use for gas-works purposes certain lands now occupied as an abattoir and store-yard; also to amend the enactment regulating the allowance of discount to gas consumers, and make new provisions in regard thereto, and to repeal section 138 of the Belfast Water Commissioners Act, 1840, with respect to the laying and maintenance of gas mains and pipes.

Belfast Water.—The Water Commissioners of Belfast purpose applying for an extension of their limits of supply, so as to include certain places in the parishes of Shankill and Drumberg. New works, comprising two filter-beds, three conduits, an aqueduct, and the widening of a bridge, are proposed. Provisions are to be made in regard to the laying of gas-pipes, the prevention of waste of water and damage to fittings, and other matters. Additional borrowing powers will be applied for.

Birmingham Corporation.—The Corporation of Birmingham intend to apply for authority for the transfer to them of the undertaking of the Birmingham Electric Supply Company, Limited. The Bill to be promoted will contain provisions in regard to the Company's debts, liabilities, contracts, &c., and to the distribution of the purchase-money on the winding up of the concern. The Corporation will require more money.

Blackpool Improvement.—In a Bill to be promoted by the Blackpool Corporation for authority to carry out improvements in the town, regulations will be included in regard to electric fittings, the measurement of electric energy, and arrears of payments for such energy and for gas; the Corporation seeking power to refuse to supply either commodity to any person whose payments are in arrear.

Bognor Urban District Water.—Authority will be sought by the Bognor District Council to purchase, by compulsion or agreement, the undertaking of the Bognor Water Company, and carry it on with the usual privileges granted to suppliers of water. The Company will be wound up. Borrowing powers will be required.

Bootle Corporation.—In a General Powers Bill to be promoted by the Corporation of Bootle, provision is to be made for the extension to districts outside the borough of some or all of the powers conferred by the Corporation's Electric Light Order of 1895, and for the alteration of the date to which accounts under that Order are made up.

Bradford Improvement.—In a Bill to be promoted by the Bradford Corporation to enable them to carry out an extensive system of tramways, provisions will be included for the acquisition, compulsorily or by agreement, of the mains, pipes, and appliances in the city belonging to the Clayton, Allerton, and Thornton Gas Company, the Pudsey Gas Company, and the Shipley Gas Company, and the extension of the gas limits of the Corporation to the whole city. Authority will be sought to supply electric fittings. Additional borrowing powers will be required.

Brigg Urban District Gas.—The Urban District Council of Brigg intend to apply for power to purchase the undertaking of the Brigg Gas Company, Limited, improve and extend the existing works, and supply gas, meters, fittings, &c. Permission to borrow the necessary money will be sought.

Bristol Gas.—The Bristol Gas Company intend to apply for power to erect storage plant, with the accessory appliances, on land at Horfield, in Gloucestershire; supply stoves, meters, engines, dynamos, &c.; prescribe and regulate the position and size of pipes, fittings, &c.; and allow discounts. Authority will be sought to lay down, maintain, alter, and renew mains, pipes, and culverts within the limits of the Company for the supply of gas, as defined by the Act of 1853, for the purpose of conveying or disposing of any oil or other materials used in or resulting from the manufacture of gas or residual products, or for any purpose connected with their business; and for any of these objects to utilize any of their existing mains, pipes, or works, whether laid in any street or road or elsewhere. It is proposed to consolidate the existing debenture stock of the Company into one general class of stock, and to ask for authority to raise further capital.

Burley-in-Wharfedale Urban District Water.—The Urban District Council of Burley-in-Wharfedale intend to apply for power to acquire, by compulsion or agreement, certain lands, with the two reservoirs and water-works erected thereon, situate on Burley Moor, known as higher and lower Lanshaw reservoirs, with the catchwaters and other works connected therewith, together with all water rights, minerals, and mineral and other rights appertaining thereto, or held and enjoyed therewith, reputed to belong to Mrs. Sophie Crofton and her Trustees. They will seek permission to make and maintain a reservoir on Carr Beck, on Burley Moor, and construct three lines of pipes in connection therewith. The usual powers granted to suppliers of water will be sought; as well as authority to raise more money.

Bury Corporation.—In a general Bill to be promoted by the Bury Corporation, authority will be sought for the consolidation of the gas-works loans, the extension of the periods for their repayment, and the application and investment of the sinking funds.

Bury Corporation Water.—The Bury Corporation will apply for power to construct new water-works; consisting of a storage reservoir on the Ogden Brook, with an aqueduct connecting it with the Black Carr reservoir at Bury, and a service reservoir at Slates, in Haslingden, with an aqueduct to it from the existing reservoir at Holden Wood. Authority will be sought for the compulsory purchase of lands, the alteration and increase of the water-rates, the raising of additional money by the issue of stock, &c.

Cambridge Gas.—The Cambridge University and Town Gas Company intend to apply for authority to raise additional capital, extend their limits of supply so as to include the parish of Histon and the portions of Grantchester, Trumpington, Chesterton, Girton, Fen Ditton, and Cherryhinton which are not already included therein. It is proposed to make special provision with respect to the appointment of an auditor or auditors of the accounts of the Company and his or their qualification and remuneration, and to alter the dates at which the ordinary meetings of the Company may be held. The Company will ask to be authorized to call in and cancel the certificates of any stock issued by them, and to grant new certificates, and make provision for ensuring and enforcing the delivery of existing certificates to the Company for cancellation. The Company wish to have power to supply stoves, meters, engines, dynamos, prepayment apparatus, &c., and to make provisions for securing the payment and recovery of gas-rates, rents, and other charges, the testing of gas, the protection of the Company's property from distraint, and the inspection of fittings. The Company will ask permission to lay a line of pipes for conveying oil or other materials from their railway sidings to the works.

Central Electric Supply.—The Central Electric Supply Company, Limited, will make application for power to generate and supply electrical energy to other bodies, and for this purpose to construct a generating station, railway, dock, and other works, at North Bank, St. John's Wood, in the parish of Marylebone.

Church Stretton Water.—The sanction of Parliament will be sought for the incorporation of a company for the construction of works and the supply of water within the parish of Church Stretton, in Shropshire. The works will comprise a reservoir and an intake-tank on the Carding Mill stream, and four aqueducts or pipe-lines. The usual powers granted to water companies will be applied for.

Clay Cross Water.—The Clay Cross Urban District Council desire to acquire, by compulsion or agreement, the undertaking of the Clay Cross Water Company, to purchase water in bulk, and to provide new storage reservoirs and other works. The usual privileges accorded to suppliers of water will be applied for, as well as power to raise money for the general purposes of the undertaking. Provision will be made for the dissolution of the Company and the distribution of the purchase-money.

Coalville Urban District Gas.—Authority will be sought by the Urban District Council of Coalville to purchase the undertaking of the Whitwick and Coalville Gas Company, renew the existing works, and supply gas in the above-named parishes and others in the county of Leicester. Provision will be made for the confirmation of any agreement for purchase entered into between the Council and the Company prior to the passing of the Bill. Borrowing powers will be applied for.

Cobham Gas.—Application will be made for the incorporation of a Company to construct works and supply gas in the parishes of Cobham, Stoke D'Abernon, Ockham, Wisley, and Byfleet, as well as a portion of Walton-on-Thames. Power will be sought to acquire the undertaking of the Cobham Gas Company, and also to apply for authority to supply electricity.

County of London and Brush Provincial Electric Lighting Company.—This Company will apply for power to erect generating stations, extend their districts of supply, and construct connecting mains within and beyond those districts.

Crowborough District Water.—The Crowborough District Water Company will apply for authority to construct additional works, consisting of wells, pumping-stations, reservoirs, and conduits in the parishes of Rotherfield and Mayfield, in Sussex, and extend their area of supply so as to include Mayfield and Hartfield, and so much of the parishes of Buxted, Rotherfield, Withyham, Wadhurst, and Frant, in that county, and of Speldhurst, in Kent, as are not already comprised within the Company's district. Provision will be made for increasing the rates and charges, the supply of fittings, and the sale of water by meter, and in bulk or otherwise, outside the limits. Additional share and loan capital will be required. The Company's Act of last year, as well as others, is to be amended.

Crowborough Gas.—It is proposed to incorporate a company to construct works for the supply of gas at Crowborough and other places in Suffolk, and to acquire the undertakings of the Crowborough and Mayfield Gas Companies; and application will be made for the necessary authority. Permission will also be sought to apply for electric lighting powers.

Darwen Corporation.—The Corporation of Darwen will apply, among

other things, for authority to construct a conduit or pipe-line in connection with the existing main line of pipes, and to make provision for the improvement of the water-works and the protection of the water. The Corporation will ask to be empowered to supply electrical fittings, and to prevent the connection or disconnection of gas-meters with gas-pipes without notice. Further borrowing powers will be sought.

Derby Corporation Water.—The Derby Corporation give notice of their intention to apply for an Act to enable them to carry out their scheme of water supply from the Rivers Derwent, Ashop, and Noe, and the Burbage Brook. The works proposed consist of a reservoir (to be called the Ronksley) to be formed upon the Derwent, and be situated partly in Hope Woodlands, in Derbyshire, and partly in Bradfield, in the West Riding of the county of York; another reservoir, to be called the Howden, and a third the Derwent, also to be formed upon that river; the Woodlands and Ashopton reservoirs, upon the Ashop; the Bamford reservoir, upon the Derwent; the Edale reservoir, upon the Noe; the Burbage reservoir, upon the Burbage Brook; four conduits or catchwaters; sixteen conduits or pipe-lines; three service-tanks; and a number of road diversions and tram roads. Special powers will be applied for with regard to the execution of works by the Corporation in conjunction with other Corporations, County Councils, and Local Authorities or bodies, and powers to those bodies to enter into agreements in reference thereto. Provision will be made for the confirmation of any agreement entered into with the County Council of Derbyshire with respect to the supply of water to Urban and Rural District Councils. Special powers are to be given to the County Council of Derbyshire to create water districts, and to constitute Joint Committees or Boards for providing a supply of water within such districts; and also to promote any Bills which may be necessary to carry out any arrangements made with the Corporation for a supply of water. The Bill will contain provisions as to the sale of water in bulk, the protection of the sources of supply and the prevention of pollution, and the framing of bye-laws and regulations; and power will be sought to make arrangements with landowners in reference thereto. It is proposed that further borrowing powers shall be conferred upon the Corporation, the Derbyshire County Council, and other public bodies.

Dorchester Corporation Gas.—The Corporation of Dorchester purpose applying for power to acquire the undertakings of the Dorchester Gas and Coke Company, Limited, and the Dorchester Gas-Fitting Company, Limited, or either of them; improve and extend all or some of the existing gas-works; supply gas, meters, and fittings, &c.; and generally carry on the business of suppliers of gas. Authority will be sought to raise the necessary money.

Dublin Corporation.—The Dublin Corporation intend to apply for power to carry out a scheme of extension, so as to include within the city the townships of Rathmines and Rathgar, Pembroke, New Kilmainham, Drumcondra, Clonliffe, Glasnevin, and Clontarf, and also certain portions of the county of Dublin. The Township Commissioners are to be dissolved, and their property, rights, powers, and privileges transferred to the Corporation. The water undertaking of the Rathmines and Rathgar Commissioners will, of course, be taken over. The new conditions will necessitate a re-adjustment of the municipal, water, and other rates. The Corporation will seek authority to supply water and electricity within the added area, and to borrow further money for the various purposes set forth in the notice. The scheme will necessitate the repeal or amendment of a number of Acts of Parliament relating to the districts concerned.

Dumbarton Burgh.—In a General Bill which the Town Council of Dumbarton intend to promote, power will be sought to extend the municipal and police boundaries of the burgh, and consequently the present limits of gas and water supply.

Dundee Gas, &c.—The Gas Commissioners of Dundee intend to apply for power to discontinue and remove portions of their existing gas-works, and erect and maintain others, comprising manufacturing, purifying, and storage plant, on lands belonging to them upon which the existing works stand, and on others which have been acquired by agreement. Authority will be sought to obtain possession of additional lands, and to raise more money. The boundaries of the city are to be extended.

East London Water.—The East London Water Company will apply for authority to construct new reservoirs and lines of pipes, and draw more water from the Thames, in accordance with a scheme of which particulars were given in the "JOURNAL" last week (p. 1174). Further money powers will be required.

Falmouth Corporation Gas and Water.—The Corporation of Falmouth gave notice to apply for power to acquire the undertakings of the Falmouth Gas and Water Companies, and carry them on; but it will be seen by the report in another column that the ratepayers have rejected the scheme.

Fishguard Water and Gas.—Application will be made for the incorporation of a company to construct and maintain works for the supply of water and gas, as well as residual products, within the parishes of Fishguard, Manorowen, and Llanwnda, in Pembrokeshire. The usual powers will be required, and also authority to apply for permission to undertake electric lighting.

Fylde Water Board.—Authority will be sought by the Fylde Water Board to issue stock to the shareholders of the Fylde Water-Works Company. The Bill to be promoted will sanction the creation of the stock, give power to trustees to invest therein, and make better provision with regard to the supply of water, the prevention of waste, the inspection and testing of fittings, and the letting thereof, as well as meters, &c., on hire.

Gainsborough Gas.—The Urban District Council of Gainsborough seek power to manufacture and supply gas, acquire the undertaking of the Gainsborough Gas Company, maintain and renew the existing works, and sell gas, fittings, &c., or let them on hire, in the Company's district, comprising Gainsborough and the parish of Morton.

Gaslight and Coke Company.—Application will be made by The Gaslight and Coke Company for further powers, including authority to raise additional share and loan capital, increase the insurance fund, and make consequential or incidental provisions. Land in the parish of East Ham is to be acquired for the construction of works for the manufacture and storage of gas and residual products, and for the general purposes of the undertaking. It is proposed to extend the time for the sale of superfluous lands, and to alter or repeal the provisions of the Lands Clauses Act, 1845, with respect thereto.

Glasgow Corporation Gas and Water.—Authority will be sought by the Glasgow Corporation for the acquisition of lands for gas purposes, and for the abandonment of the Dalmarnock works. The scheme of the Corporation was described in the "JOURNAL" for the 8th inst. (p. 1040). In the Bill to be promoted, provisions will be included for making tenants liable for the gas and electricity rents of sub-tenants, and generally with regard to the supply and payment for gas and electricity, and the inspection of service-pipes. The Sale of Gas Act, 1859, is to be amended in respect of meter registration. It is proposed to acquire the Partick and other electricity works, and supply current beyond the city. Additional borrowing powers will be applied for.

Glastonbury Water.—The Corporation of Glastonbury intend to ask for authority to construct certain water-works, consisting of a well and two conduits or pipe-lines, and supply water not only in Glastonbury, but also in Pilton, North Wootton, West Pennard, Baltonsborough, Sharpham, and Street, all in the county of Somerset. Additional borrowing powers will be sought.

Godalming Water.—The Corporation of Godalming wish to acquire, by agreement or compulsion, the undertaking of the Frith Hill, Godalming, and Farncombe Water Company, Limited, and have the exclusive right to supply water within certain limits. In the Bill to be promoted, provisions will be included for the prevention of the pollution of the water, the regulation of the supply, &c. The Company will be wound up. Borrowing powers will be required.

Goole Urban District Council.—The Urban District Council of Goole intend to apply for power to construct new water-works, consisting of a pumping-station in the township of Pollington and three aqueducts. The limits of supply are to be extended, so as to include the townships of Rawcliffe, Snaith and Cowick, Pollington, and Gowdall, all in the West Riding of the county of York. The Council will require additional borrowing powers both for water and gas works purposes.

Great Yarmouth Water.—Authority will be sought by the Great Yarmouth Water Company to construct additional works, consisting of two pipe-lines, and to extend the limits of supply so as to include part of Southtown, Runham, and the detached portion of Acle lying near Great Yarmouth. Additional capital will be required.

Hastings and St. Leonards Gas.—The Hastings and St. Leonards Gas Company wish for authority to purchase, by agreement, certain lands for the construction of gas-works. The Bill to be promoted will include provisions for the maintenance of the existing works, the erection of houses and cottages for officers and servants, and the construction of sidings and ancillary works. It is proposed to extend the limits of supply so as to include Bexhill and Crowhurst; and power will be sought to purchase the gas and water undertakings of the Bexhill Water and Gas Company. It is intended to apply for power to accept from the Hastings Corporation, the Hastings and St. Leonards Electric Light Company, and the Bexhill Urban Sanitary Authority, a transfer of the electric lighting powers which have been conferred upon them; and the Company will seek permission to apply their funds in making application for a Provisional Order under the Electric Lighting Acts. Provisions will be included in regard to the manufacture and supply of stoves, fittings, &c., the regulation of meters and fittings, and the exemption thereof from liability to distress. Additional capital will be required.

Herne Bay Water.—The Herne Bay Water Company will apply for power to construct new works, consisting of a service reservoir to the north of the existing pumping-station of the Company at Mickleburgh Hill, and two aqueducts or pipe-lines. Authority will be sought to purchase lands, waters, and easements compulsorily. Additional capital will be required.

Highland Water Power.—Application will be made for the incorporation of a Company to supply water for power and other purposes from Loch Ericht. The works comprise a water power and electricity generating station near the head of Loch Leven, in Inverness-shire, and reservoirs, aqueducts, and other works in that county, as well as in Perthshire and Argyllshire; also stations and apparatus for developing water power, and for generating, storing, and distributing electricity. In the Bill to be promoted, provision will be made for acquiring lands compulsorily, giving compensation water, and making agreements with public bodies.

Horsforth Urban District Council (Water Transfer).—The Urban District Council of Horsforth intend to apply for power to purchase, by compulsion or agreement, the undertaking of the Horsforth Water Company, with the rights and privileges attaching thereto. In the event of the purchase taking place, the Company will be wound up.

Horsforth Water.—Application is to be made by the Horsforth Water Company for power to construct works consisting of a reservoir, to be situated in Burley-in-Wharfedale, four aqueducts or pipe-lines, and a waste-water conduit. Additional capital will be applied for.

Ilford Gas.—The Ilford Gas Company will ask for authority to extend their works on land lately purchased, dissolve and re-incorporate the Company, consolidate and increase the existing capital, and raise more money.

Ilford Urban District Gas.—The Urban District Council of Ilford seek authority to acquire the undertaking of the Ilford Gas Company, and so much of that of the Barking Gas Company as is situate within the district of the Council, who desire to have exclusive powers to supply gas therein; also to maintain, improve, and extend all or some of the existing works, and construct new ones. The usual powers for the supply of meters, fittings, &c., will be sought; as well as authority to raise money.

Lanarkshire (Middle Ward District) Water.—The District Committee of the Middle Ward of Lanarkshire desire power to construct additional water-works, consisting of three service reservoirs. It is proposed to alter or repeal certain provisions of the Lanarkshire (Middle Ward District) Water Acts of 1892 and 1896 with respect to the domestic water-rate. More money will be required.

Lancashire Electric Power Company.—Application will be made for the incorporation of a company to construct works and supply electrical energy in a number of places in Lancashire and Cheshire, including Liverpool and Manchester, and to enter into agreements with local authorities and others for the sale of electricity in bulk or otherwise.

Lea Bridge Gas.—Application will be made by the Lea Bridge District Gas Company for power to convert and consolidate the existing capital, and raise more. Authority will be sought for the purchase of additional lands, and for the construction of works for the manufacture and storage of gas on those already acquired. Power will be applied for to supply gas in bulk, lay pipes for telegraphs or telephones, and for the conveyance of water or oil, make regulations for the supply of gas for engines, and purchase or hire railway waggons and trucks.

Leicester and Warwickshire Electric Supply Company.—It is proposed to apply for powers of incorporation for a similar company to the one mentioned above to supply electrical energy within parts of the counties of Leicester, Warwick, and Derby.

Leicester Corporation Water.—The Corporation of Leicester will apply for power to construct new water-works, comprising four storage reservoirs in the parish of Hope Woodlands, one in that parish and in Derwent, an intake in the parishes of Derwent and Bamford, a large number of road diversions, aqueducts, and pipe-lines, and several service reservoirs and overflows. Authority will be sought to appropriate the waters of the Rivers Derwent and Ashop and all their tributary streams and springs above the point where the Bamford reservoir will cross the first-named river. The usual privileges granted in connection with the supply of water will be applied for, as well as authority for the creation of a Joint Board composed of the Corporations of Leicester and Derby, and the transfer to them of certain powers of the intended Act as to the construction of works and the acquisition of lands therefor, the borrowing of money, and the levying of rates and charges.

Leigh-on-Sea Urban District Council.—Power will be sought by the Urban District Council of Leigh-on-Sea, in Essex, to manufacture and supply gas within their district, and to purchase, by compulsion or agreement, the works and plant, or some portion thereof, belonging to Messrs. S. & H. S. While, trading as the Leigh-on-Sea Gas Company. The Council desire authority to maintain the existing works and construct new ones, and to acquire land for the purpose by compulsion or agreement. The usual privileges granted to gas companies will be applied for.

London County Council (General Powers).—In a General Bill of which notice has been given by the London County Council, power will be sought to dissolve and re-constitute the Lea Conservancy Board. It is proposed to define the number of members of the new Board, and to abolish or alter the right of any corporation, body, company, or person to nominate, appoint, or elect members. Provision is to be made for the nomination or appointment of members by the Council, the Corporations of London and West Ham, and the County Councils of Middlesex, Essex, Bedford, and Hertfordshire, or some of those bodies, and by such other companies, bodies, and persons as may be named in the Bill or be determined by Parliament. The powers of the existing Board are to be vested in the new one. The Lea Conservancy Act, 1868, and Acts of the New River and East London Water Companies are to be altered or amended.

London Water (Aqueducts and Works).—The London County Council notify their intention of applying for power to construct storage and service reservoirs on the River Yrfon, in Brecknockshire, and at Boreham Wood, in Hertfordshire, together with filter-beds near Edgware and Hendon, and other works, as set forth in the "JOURNAL" last week (p. 1174).

London Water (Finance).—The London County Council intend to apply to Parliament for power to raise money for the purchase of the Water Companies' undertakings; and a Bill will be promoted to sanction the creation and issue of stock or annuities (terminable or otherwise) to such amount as may be necessary for the purpose. The stock or annuities will be charged upon the revenue derivable from any undertaking purchased, and collaterally upon the county rate of the Administrative County of London. The Bill may provide that, in the event of the Council being empowered to construct water-works, or purchase lands, water, or water rights for the purposes of water-works, the moneys necessary for such construction or purchase, and purposes incidental thereto, may be raised in the manner above provided.

London Water (Purchase of Companies).—The London County Council will seek authority to acquire, by agreement or upon arbitration terms, the undertakings of the eight London Water Companies, and that of the Staines Reservoirs Joint Committee. In the Bill to be promoted, provision will be made for the appointment and procedure of the arbitrator, and the settlement of the terms of purchase; the connection of the Companies' systems, and the management and administration of the supply; the appointment of Committees, and the representation of the London Corporation thereon; the transfer of parts of the entire undertaking to extra-Metropolitan Local Authorities, and the combination of such Authorities; the management of the water supply in districts outside the Metropolis, &c. The several Companies and the Staines Reservoirs Committee will be dissolved. Stock and annuities are to be created; and the sinking funds held by the Chamberlain of London are to be applicable to the proposed purchase.

London Water (Welsh Reservoirs and Works).—The London County Council will also apply for authority to carry out their scheme for the supply of London and the adjoining districts with water from Wales. This scheme has so recently been dealt with at great length in our columns, in connection with the elaborate report of Sir B. Baker and Mr. G. F. Deacon thereon, that it is only necessary to give a bare outline of the notice. The works comprise the Yrfon, Towy, Upper Wye, and Llanafan reservoirs, several aqueducts, and a number of road diversions. The waters of the Yrfon, Towy, Wye, Chwefri, and tributary streams, are to be impounded, lands and buildings submerged, and a section of the London and North-Western Railway diverted. Provision will be made for the purchase by agreement of lands in the watersheds of the three rivers first above named, and for other lands and easements; the supply of compensation water; the creation of stock and annuities; and the charging of the cost of the scheme upon the water-rates and revenue of the undertaking.

Loughborough Corporation.—The Corporation of Loughborough will apply for power to purchase the undertaking of the Loughborough Gas Company; maintain, extend, and construct works; and supply gas in the borough and the adjacent parishes of Nanpantan, Thorepeacre-cum-Dishley, Hathern, and Woodthorpe. Authority will be sought to erect a generating station and supply electricity; also gas and electric light fittings, stoves, &c. Further money powers will be needed.

Loughborough Gas.—The Loughborough Gas Company will apply for authority to raise additional capital, deal in stoves, fittings, &c., supply gas in bulk, apply for an Electric Lighting Order, and erect dwellings for persons in their employ.

Lowestoft Water and Gas.—Application will be made by the Lowestoft Water and Gas Company for power to construct additional works, comprising a service reservoir, situated in Lowestoft, and four conduits or pipe-lines. Permission will be sought to extend the time for the purchase of lands and the completion of works sanctioned by the Lowestoft Water and Gas Act, 1897, and for the preparation of the scheme thereby authorized for the consolidation of the preference share capital of the Company. Additional capital will be applied for.

Maidstone Corporation Water.—The Corporation of Maidstone give notice of their intention to apply for authority to purchase the undertaking of the Maidstone Water Company, maintain and extend the existing works, and supply water within the present limits, which it is proposed to enlarge so as to include Barming, East Farleigh, Loose, Boxley, and Aylesford. In the Bill to be promoted, provisions will be included in regard to the pressure at which the water will be supplied, the sale of water by meter and in bulk, the inspection of premises, and the supply of fittings; and measures will be adopted for preventing the contamination of the supply. Further borrowing powers will be sought.

Manchester Corporation.—In a Bill to obtain general powers, the Manchester Corporation will seek to make better provision for the lighting of "no thoroughfares" and other places, and apply for authority to purchase electrical motors and apparatus, and let the same on hire; also to amend and extend the expression "any district adjacent to the city," contained in section 39 of the Corporation's Act of 1897. An insurance fund is to be established; and more money will be needed.

Menstone Water.—The Menstone Water Company will seek to be dissolved and re-incorporated with increased capital, which is to be defined. Authority will be sought for the construction of a storage reservoir in the township of Menstone, and for the appropriation of springs on Hawksworth and Burley Moors. The usual powers granted to suppliers of water will be applied for.

Metropolitan Electric Supply.—Power will be sought by the Metropolitan Electric Supply Company, Limited, to supply electricity or electric energy within the City of London, and to enter into agreements with the Corporation in regard thereto.

Metropolitan Water Companies (Intercommunication of Mains and Works).—The scheme projected by the London Water Companies for effecting intercommunication between their mains and works, for carrying out which they will apply for power next session, was fully dealt with in the "JOURNAL" last week (p. 1174).

Mid-Kent Gas.—Authority will be sought for the incorporation of a company to construct works and supply gas and residual products in the parishes of Snodland, Halling, Birling, Leybourne, Cuxton, Meopham, Luddesdown, East and West Malling, Wateringbury, East and West Barming, Wrotham, Ightham, Kemsing, Hadlow, East and West Peckham, Capel, Pembury, Brenchley, Horsmonden, Yalding, Marden, Staplehurst, Wouldham, Burham, Aylesford, Ryarsh, Offham, Nettlestead, Teston, Ditton, Stanstead, Trottersciffe, Addington, Sutton Valence, and Headcorn, all in Kent, and so much of the parish of Lamberhurst as is situate in that county. The usual powers will be asked for in regard to purchasing land, breaking up streets, levying rates and charges, supplying gas in bulk, inspecting fittings, and holding patent rights. The promoters wish to be authorized to apply for a Licence or Provisional Order under the Electric Lighting Acts, and to purchase or lease any gas-works belonging to other parties.

Nene Valley Water.—Power will be sought to incorporate a company to construct works and supply water in a number of places in the county of Nottingham. A well is to be sunk at Little Addington, and the water drawn therefrom will be conveyed by a conduit or pipe-line to a service reservoir at Finedon. The usual privileges granted to water companies will be applied for.

Newhaven and Seaford Water Board.—Authority will be sought for the constitution and incorporation of a Water Board, composed of representatives of the Urban District Councils of Newhaven and Seaford, to acquire and carry on the undertaking of the Newhaven and Seaford Water Company. The Board are to have power to maintain the existing, and construct other works, and to take, use, and supply water within the limits of the Councils and the parishes of Bishopstone, Denton, South Heighton, Tarring Neville, Piddinghoe, Telscombe, Southease, Rodmell, Iford, and Kingston-near-Lewes, all in Sussex. Provision will be made for the representation of other districts upon the Board, for the levying of rates and charges, and for the borrowing of money; also for the dissolution of the Company.

New Mills Urban District Council Water.—Application will be made by the New Mills Urban District Council for power to acquire the undertaking authorized by the Ollerset Water-Works Act, 1831, and a portion of the undertaking of the Stockport District Water Company, and to supply water to that part of the urban district of New Mills known as the parish of Newtown. The Council purpose constructing works comprising a number of aqueducts, two reservoirs, wells, adits, &c., and also extending their existing works. In the Bill to be promoted, provisions will be included in regard to the prevention of waste, the supply of water-fittings, and the sale of water to other authorities and companies. Additional borrowing powers will be applied for.

Nottingham Corporation.—In a Bill to be promoted by the Corporation of Nottingham to enable them to carry out an extensive scheme of tramways, to be worked by electricity and other motive power, provisions will be included for the construction of water-works. They will comprise a covered reservoir in the parish of Bestwood Park, another in the parish of Greasley, and seven aqueducts or pipe-lines. Authority will be sought to abandon the aqueduct described as No. 1 in the Corporation's Act of 1897, and also a portion of No. 3. The new works will, of course, form part of the water undertaking of the Corporation. Power will be applied for to hold any property acquired under the intended Act free from provisions of the Lands Clauses Consolidation

Act, 1845, with respect to any superfluous lands; and also to exempt the Corporation from the operation of section 92 of that Act, so as to enable them to purchase compulsorily part only of certain properties. Additional money powers will be sought.

Nuneaton and Chilvers Coton Urban District Council.—Application will be made by the Nuneaton and Chilvers Coton Urban District Council for power to construct additional water-works, comprising two wells and three conduits or pipe-lines. It is proposed to vary the East Warwickshire Water Act of 1897 in regard to rates and charges, and amend other Acts. More money will be required.

Otley Water.—The Otley Urban District Council will apply for power to construct additional water-works, comprising two reservoirs and two aqueducts, impound the waters of certain streams and their tributaries, and raise further money.

Perth Water, Police, and Gas.—The Perth Commissioners will apply for authority to construct new water-works, consisting of a reservoir and three aqueducts, with a road diversion. Borrowing powers will be required in respect of both the water and the gas undertakings of the Commissioners.

Rawtenstall Water.—The Corporation of Rawtenstall will apply to be severed from the water undertaking of the Bury Corporation, and to have power to purchase the mains, &c., in the town, at a price to be settled by agreement or arbitration. It is proposed to construct new works, consisting of a storage reservoir in the parish of Ramsbottom, and a conduit therefrom to Walmersley-cum-Shuttleworth, two other reservoirs in these parishes, and various aqueducts. The usual provisions in regard to the protection of the sources from pollution, the provision of compensation water, the supply of water and fittings, the sale of water to public bodies, &c., will be included in the Bill to be promoted. Borrowing powers will be applied for.

Redditch Gas.—The Redditch Town and District Gas Company desire to be dissolved and re-incorporated with power to supply gas in a more extended district than that defined in their Provisional Order of 1873. Power will be sought to maintain and continue the existing gas-works and construct others connected therewith, manufacture gas and residual products, supply meters, fittings, &c., and raise additional capital.

Reigate Corporation Gas.—The Corporation of Reigate will apply for power to purchase, by compulsion or agreement, the undertakings of the Redhill and Reigate Gas Companies, maintain, continue, and extend the existing works of these Companies, and supply gas within the present limits of the Redhill Company. Authority will be sought to sell gas in bulk, supply fittings, &c., levy rates and charges, and acquire additional lands. It is proposed to amend or repeal the Redhill Gas Act, 1865, and make it applicable to the Corporation. Provision will be made for the payment of the costs of the opposition by the Corporation to the Bills promoted by the above-named Companies last session. Power to borrow money will be sought.

Rhondda Urban District Council.—Application will be made by the Rhondda Urban District Council for an extension of the time limited by the Ystradyfodwg Urban District Council (Gas and Water) Act, 1896, for the purchase of lands and the construction of works authorized thereby. It is proposed to carry out certain new works, comprising tram and carriage roads, four wells and pumping-stations, a pumping-station and a tank, an aqueduct, and a service reservoir. Land in the parish of Rhigos is to be acquired for the purposes of the water undertaking. Further money will be needed.

Rushden and Higham Ferrers Gas.—The Rushden and Higham Ferrers District Gas Company, Limited, will apply to be dissolved and re-incorporated with power to supply gas and residual products, stoves, fittings, &c., in the above-named towns and the neighbourhood. In the Bill to be promoted, provision will be made for the inspection and regulation of meters, pipes, and fittings, and the exemption of the last named from distress; also with respect to any purchase of the Company's undertaking by the Corporation of Higham Ferrers and the Urban District Council of Rushden which they or either of them may be empowered by Parliament to effect. The Company wish authority to apply for power to supply electricity, and also to raise more capital.

St. Albans Gas.—The St. Albans Gas Company intend to apply for power to extend their limits of supply so as to include portions of the parishes of St. Alban, St. Peter Rural, St. Michael Rural, Sandridge Rural, and St. Stephen. It is proposed to acquire land in either the last-named parish or St. Alban for the construction of gas-works. Provision will be made with regard to the erroneous registration of meters, the scale of voting at meetings, the qualification of Directors, the dividends, and the price of gas. The capital is to be consolidated, and more will be asked for. The Company will seek to be enabled to agree for, and accept, a transfer from the Corporation of their electric light undertaking.

St. David's Gas and Water.—It is proposed to incorporate a company to construct water and gas works, and supply water and gas in the city of St. David's, the Cathedral Close, and the parishes of St. David's and Whitchurch, in the county of Pembroke. The water-works will consist of a well or wells and a pumping-station on Morfa Common, a service reservoir, and three aqueducts or pipe-lines; and the gas-works are to be erected adjoining the public road at Porthclais. The Bill to be promoted will contain provisions in regard to the supply of gas in bulk, the sale or letting on hire of meters, fittings, stoves, &c., and the protection of the sources of water.

St. Marylebone Vestry Electric Lighting.—Application will be made by the Vestry of St. Marylebone for power to purchase the portion of the undertaking of the Metropolitan Electric Supply Company, Limited, within that parish, and produce and supply electricity and electric apparatus, or to purchase electrical energy in bulk from the Company or any other company, body, or person. Additional borrowing powers will be required.

St. Neots Water.—Application will be made by the St. Neots Water Company for power to construct new works, consisting of wells and pumping-stations, several pipe-lines, and a covered service reservoir. It is proposed to extend the limits of supply to include several parishes in Bedfordshire, and to exempt the Company from giving a constant service of water in the added area, or delivering it at a higher level than can be served by gravitation from the intended reservoir. It is proposed to change the name of the Company. Additional capital will be required.

Salford Corporation.—In a General Bill to be promoted by the Salford Corporation, authority will be sought to extend to water rates, rents, and charges payable to the Corporation, the provisions of the Preferential Payments in Bankruptcy Act, 1888, as to priority of local and parochial rates.

Scunthorpe Gas and Water.—The Scunthorpe Urban District Council will apply for power to purchase, by compulsion or agreement, lands for gas and water works purposes, and to construct thereon works for the manufacture and storage of gas and residual products. The works and plant, or a portion thereof, belonging to Messrs. Cliff, trading as the Frodingham Iron and Steel Company, are to be acquired. Authority will also be sought to construct water-works. The limits of supply will be Scunthorpe, Brumby, and Frodingham, and the township of Crosby in the rural district of Glanford Brigg, all in Lincolnshire. The Local Authorities of Brumby, Frodingham, and Crosby are to take over portions of the mains and pipes in certain events. The Bill will sanction the payment by the Council of £500, and by the Brumby and Frodingham Council of £100, towards the costs of promoting the Frodingham Gas Bill of the past session. Additional capital will be required.

Sheffield Corporation (Derwent Valley) Water.—Application is to be made by the Corporation of Sheffield for power to carry out works for obtaining a supply of water from the Derwent and Ashop Rivers, and other rivers and streams and their tributaries. The works comprise three reservoirs on the Derwent; a weir across the Ashop; an aqueduct commencing just above the weir, and terminating in the Ouzelden Brook, near its junction with the Derwent; another commencing at the Howden reservoir, and terminating near the Mytham Bridge across the Derwent; a third commencing at the Derwent reservoir, and joining the existing pipes of the Corporation immediately to the east of the embankment of the Rivelin lower reservoir; together with various road diversions and a new road. Powers will be sought for taking water from the above-named rivers and a number of streams, brooks, and springs, and for giving compensation water. It is proposed to provide for the constitution of a Joint Committee, to consist of members of the Corporations of Rotherham and Doncaster, and any other corporation, urban or other local or sanitary authority, and to vest in a Committee such of the powers, whether with reference to the construction, management, or maintenance of works conferred by the intended Act on the Corporation, as may be prescribed; also to confer such other powers as may be necessary or expedient on the Joint Committee, and to define and regulate its duties, make provision for the election, appointment, retirement, rotation, and qualification of the members, and for the appointment and payment of officers. The water and other works proposed to be authorized by the intended Act are to be constituted a part of the water undertaking of the Corporation; and all or some of the enactments now in force in relation to those works are to be extended and applied to the proposed additional works. Sanction will be sought for the supply of water in bulk to the Corporations of Rotherham and Doncaster, as well as to other authorities; and it is proposed to confer on those Corporations power to borrow more money. The promoting Corporation will apply for permission to issue further stock.

Shirebrook and District Gas.—Application will be made for the incorporation of a company for the construction of works and the supply of gas and residual products in part of Pleasley (including part of the township of Shirebrook), Scarcliffe, and Upper Langwith, in Derbyshire, Nether Langwith and Sookholme, in Nottinghamshire, and part of Warsop, in the same county. Authority will be sought for the confirmation of an agreement made or to be made with the Mansfield Corporation for the transfer to the promoters of certain rights and privileges; and it is proposed to repeal portions of the Mansfield Commissioners' Gas Act of 1878. Permission will be asked by the promoters to apply for power to supply electricity for lighting and other purposes.

Shotley Bridge and Consett Gas.—The Shotley Bridge and Consett District Gas Company will apply for power to extend their limits of supply, so as to include the whole or a portion of Healey Field, in the parish of Lanchester. Authority is to be sought for raising additional capital, consolidating and converting the stock, altering the provisions of the Company's Act of 1869 with regard to illuminating power, and for effecting other changes.

Skipton Gas.—The Skipton Gas Company require authority to purchase certain lands by agreement, increase the illuminating power of their gas from 14 to 15 candles, adopt the sliding-scale, and raise additional capital.

Skipton Gas.—The Urban District Council of Skipton intend to apply for authority to purchase the undertaking of the Skipton Gas Company, and maintain, improve, and extend the existing works, construct new ones, and acquire land for the purpose. They will also seek power to supply gas, meters, and fittings; levy rents, rates, and charges; and raise money for the purposes set forth.

South Essex Water.—The South Essex Water Company notify their intention of applying for power to construct water-works, comprising a well and pumping-station in the parish of Mucking, a reservoir in the parish of Laindon Hills, and an aqueduct or pipe-line connecting them. Power will be sought to acquire the undertaking of the Herts and Essex Water Company, Limited; also to form pension and superannuation funds. Additional capital will be required.

South Hants Water.—Application will be made by the South Hants Water Company for power to construct new works, comprising a pumping station in the parish of King's Somborne, a conduit thence to the pipes leading to the existing reservoir of the Company in Michelmersh, an adit at Timsbury, a covered service reservoir on Lyndhurst Hill in the New Forest, and a pipe-line therefrom to the present distributing system. It is desired to extend the limits of supply so as to include a number of places in the county of Southampton. The Company wish to make it compulsory on owners of property to provide cisterns; and they will prescribe the size thereof, and make regulations in regard thereto. They also desire to purchase the undertaking of the Bishop's Waltham Water Company, Limited; and to supply Brockenhurst with water if the West Hampshire Company fail to do so. Application will be made for an extension of the time limited by section 4 of the South Hants Water Act, 1894, for the supply of water by the Company to

certain parishes therein mentioned, with regard to the restriction imposed by section 52 of the Public Health Act, 1875, on the construction of water-works by a local authority; and various amendments of Acts are proposed. Further money powers are required.

South Lancashire and Cheshire Electricity Company.—Power will be sought to incorporate a company for the construction of works for the production and supply of electrical energy in a number of towns in Lancashire and Cheshire; and to enable the company to make agreements for the sale of electricity in bulk.

Stockport Corporation Water.—The Corporation of Stockport are desirous of purchasing the undertaking of the Stockport District Water Company, and carrying on their works with the exclusive right of supply within the Company's limits. In the Bill to be promoted for this purpose, provision will be made for the settlement by arbitration, in default of agreement, of the amount of the purchase-money or compensation for, and the terms and conditions of, the transfer. Additional borrowing powers will be required.

Stockport Water.—Application is to be made by the Stockport District Water-Works Company for authority to confirm three agreements, dated respectively March 17, 1859, Oct. 9, 1877, and Feb. 15, 1897, made between the Manchester Corporation and the Stockport Water Company and the Stockport District Water Company, and to amend or repeal such provisions of the Acts of 1861, 1863, and 1864 of the latter Company as may be necessary.

Stockton and Middlesbrough Water.—The Stockton and Middlesbrough Water Board will apply for power to construct a new service reservoir and aqueduct in the parish of Long Newton, in Durham. The former will be 390 yards square, have a superficial area of 30 acres, and be capable of holding about 100 million gallons; the latter will connect the new reservoir with one of the existing conduits. It is proposed to extend the limits of supply so as to include the parish of Croft, in the North Riding of the county of York. Certain provisions of existing Acts are to be repealed—in the first place, to allow of the abstraction of water from the Grassholm reservoir; secondly, to alter the charge for water used for trade purposes; and, lastly, as to fish passes. The corporate name of the Joint Board is to be changed. Further money powers will be needed.

Stretford Gas.—The Stretford Gas Company purpose applying for an extension of their limits of supply so as to include the parishes of Carrington and Partington, in Chester. Additional lands are to be purchased; and in the Bill to be promoted provisions will be included in regard to the supply of stoves and fittings, the inspection of pipes and fittings in new buildings, and other matters. The present capital is to be consolidated, and more will be applied for.

Totland Water.—The Totland Water-Works Company, Limited, desire to be dissolved and re-incorporated with powers of supply within limits which are fully defined in the notice. The present works are to be maintained, and new ones constructed, comprising a service reservoir at Headon Hill and subsidiary works in connection therewith. It is proposed to repeal so much of the Freshwater and Yarmouth Water Order, 1887, as authorizes the Freshwater and Yarmouth Water Company, Limited, to supply water within the portion of the parish of Totland intended to be served by the Totland Company, and to determine the powers of the Freshwater Company within that area. Additional capital will be required.

Wakefield Corporation.—The Corporation of Wakefield intend to apply for an extension of time for the construction of works authorized by their Act of 1889, and for general powers to carry out such others as they may deem necessary.

Walker and Wallsend Union Gas Company (Electric Lighting).—Application will be made by the Walker and Wallsend Union Gas Company for power to construct works for the production and supply of electricity within their gas limits, and to make agreements with local bodies with respect to such supply, or for the sale or transfer of the undertaking or powers of the Company, or some part thereof, to such parties. Additional capital will be required. In the Bill to be promoted, the Company will seek permission to apply to the purposes therein set forth any of their unexpended or additional funds; and will, if deemed advisable, constitute the new undertaking a separate one for which special accounts will be kept.

Walton-on-Thames and Weybridge Gas.—The Walton-on-Thames and Weybridge Gas Company will apply for power to consolidate and convert their existing capital, and raise more money. Authority will be asked for the supply of stoves, fittings, &c.

Warrington Corporation.—In a General Powers Bill to be promoted by the Warrington Corporation, authority will be sought for the construction of water-works, comprising a pumping-station in the parish of Winwick-with-Hulme, a reservoir in that parish, another in the parish of Appleton-with-Hull, a large reservoir (the Daresbury) situated in four parishes, and a storage reservoir (the Dennow) in the above-named parish of Appleton-with-Hull; together with various wells, boreholes, tunnels, pipe-lines, &c. Powers will be applied for to purchase lands compulsorily, interfere with streams and other property, and frame regulations for preventing waste and contamination of water. It is proposed to consolidate the existing loans of the Corporation; and permission will be sought for raising more money.

West Gloucestershire Water.—The West Gloucestershire Water Company will apply for an extension of the limits within which they may supply water under their Acts of 1884 and 1887, so as to include a number of other places named in the counties of Gloucester and Somerset. It is proposed to make owners liable for water-rates in the case of premises let for less than a quarter of a year. Additional capital will be required.

West Middlesex Water.—The West Middlesex Water Company intend to apply for power to put down a new main between their pumping-station at Hampton and their works at Barnes. The Company will seek authority, pending the completion of the reservoirs and works authorized by the Staines Reservoirs Acts, 1896 and 1898, or during such other period as may be prescribed or defined by the intended Act, to take from the River Thames such quantity of water, in excess of that which they may now draw, and on such terms and conditions, as may be agreed between them and the Conservators of the Thames, or may be prescribed by the intended Act. Additional capital will be required.

Wetherby District Water.—Powers of incorporation will be sought for a company to construct works and supply water in a number of parishes, townships, and places in the West Riding of the county of York. There will be a pumping-station at Wigton, another at Scarcroft, and a third at Bardsey-cum-Rigton; a water-tower at Wigton and a service reservoir at Bardsey; and seven conduits or pipe-lines. The Bill to be promoted for carrying out the above-named objects will contain the usual provisions as to the compulsory purchase of lands, water-rights, and easements; the supply of fittings; the sale of water in bulk; the levying of rents, rates, and charges; and the making of agreements with public bodies. The capital and borrowing powers of the Company will be defined.

Whitehaven Corporation.—Application will be made by the Whitehaven Corporation for a revival of the powers conferred by the Whitehaven Town and Harbour Incorporation Act, 1885, in regard to the construction of works at Ennerdale Lake to allow of a supply of water being obtained from that source, and for authority to construct additional works. The Corporation will also apply for an extension of their electric lighting area so as to include the whole of the existing borough, or any enlargement thereof which may be sanctioned. Additional money will be required, as well as power to alter the present water-rates, and increase them.

Wishaw Water.—The Commissioners of the Burgh of Wishaw intend to apply for an enlargement of the borrowing powers conferred by the Wishaw Water (Additional Supply) Act of last session, the principal provisions of which were noticed in the "JOURNAL" for Nov. 8, for the purposes of their water-works. The extra money to be borrowed will rank with the sums authorized by that Act to be raised.

Woking Water and Gas.—The Woking Water and Gas Company will apply for authority to construct additional works, consisting of several wells and pumping-stations, aqueducts, or pipe-lines, all in the county of Surrey. The limits of supply are to be extended so as to include portions of several parishes in that county; and power will be sought to make provision for the prevention of waste and undue consumption. It is proposed to increase the capital.

Wolverhampton Corporation.—In a Tramway Bill to be promoted by the Wolverhampton Corporation, authority will be sought to enter into contracts and agreements with the Bilston, Coseley, and Sedgley Urban District Councils, and the South Staffordshire Water Company, with reference to the supply of water within the urban districts of Coseley and Sedgley, or any part thereof.

Workington Corporation Water.—The Corporation of Workington intend to apply for power to construct new works, consisting of a service reservoir, two aqueducts or pipe-lines, and two weirs upon the River Cocker. Various streams and waters are to be impounded; and the level of Crummock Water is to be raised. Authority will be sought for the purchase of the shares of the Cockermouth Urban and Rural District Councils in the Cockermouth and Workington Joint Water Committee's undertaking, and the dissolution of the Committee. Borrowing powers will be required.

Yeadon and Guiseley Gas.—The Yeadon and Guiseley Gas Company notify their intention to apply for authority to amend their Acts of 1868 and 1880, so as to substitute the sliding-scale for a fixed maximum price for the gas supplied by them.

The applications to the Board of Trade and the Local Government Board for Provisional Orders under the Gas and Water Works Facilities Act, 1870, and the Public Health Act, 1875, as well as those made to the former Board under the Electric Lighting Acts, 1882 and 1888, will be dealt with next week, when all the notices in regard thereto have appeared in the "London Gazette."

Saltash Water Supply.—On the recommendation of the Water Committee, the Saltash Town Council decided last Tuesday to take steps for the construction of a reservoir. The water supply is obtained from Plymouth by means of a pipe laid across the bed of the River Tamar; and Messrs. Jenkin and Son, who are to advise the Committee respecting the reservoir, will be asked to consider the question of the duplication of this main in order to ensure a continuous supply.

The Quality of Portsmouth Gas.—It may be remembered that at the meeting of the Portsmouth Corporation on Sept. 13, complaint was made as to the quality of the gas supplied by the Portsea Island Gas Company; the quantity of ammonia present being much in excess of that permitted by statute. A proposal was submitted to prosecute the Company unless the ammonia were reduced within a month; but an amendment was brought up to the effect that proceedings should be instituted at once. However, in the end, neither proposition was carried; and accordingly the matter was left as it stood. Since then the Company have taken steps to remove the cause of complaint; and the result came before the Council at their meeting last Tuesday. The Finance Committee reported that the Gas Examiner in his return for the quarter ending Oct. 12, stated that 42 tests of the gas had been made for ammonia, and that, although 33 of them showed an excess, all since Sept. 28 had been within the prescribed limit; the average, however, had been 9 54 grains per 100 feet.

Portsmouth Water Company.—The half-yearly general meeting of this Company was held last Thursday—Mr. W. Grant, J.P., in the chair. In moving the adoption of the report, noticed in the "JOURNAL" last week (p. 1176), the Chairman referred to the gratifying fact that during the past four years the water rental had increased by 11 per cent. The Directors were carrying forward a large balance which they thought was necessary. With reference to the drought of last summer, he could only say that but for the lavish expenditure, spread over a long time, by the Board, the supply of the last two years could never have been maintained. He also spoke in terms of satisfaction as to the proposed payment of another series of back dividends. Colonel C. L. Owen seconded the motion; and it was carried unanimously. On the proposition of Mr. J. H. Hefferman, seconded by Major-General R. M. Westropp, the Directors' fees were raised from £840 to £1000 per annum; the mover remarking that while during the past seventeen years the capital of the Company had doubled, the revenue had increased from £30,000 to £58,000 per annum. The Chairman thanked the shareholders for this renewed mark of their confidence; and the meeting closed.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Tuesday, Nov. 22.

(*Before Mr. Justice* KEKEWICH.)

Holophane, Limited, v. O. Berend and Company.

This was an action brought by the plaintiff Company against the defendants for infringement of patent.

Mr. JESSEL, who appeared for plaintiffs, said that at the last moment the defendants had agreed to submit to an injunction—the plaintiffs waiving any inquiry as to damages—and to pay the plaintiffs' costs. He therefore had to ask simply for two things—a certificate that the particulars of breaches were reasonable and proper; and another that the validity of the patent had come in question.

Justice KEKEWICH said he thought he was bound by authority.

Mr. JESSEL having cited cases to show that such certificates had been granted, even when the defendant did not appear,

Mr. CANN, who represented the defendants, said he had agreed with his learned friend, as had been already stated, and there was an honourable understanding that he should abide by his Lordship's decision on this point about the certificates, and, if he thought that they should be granted, not oppose it.

Justice KEKEWICH said this left him in rather an awkward position, as his attention had not been called to some of the more recent cases; but he was quite satisfied that the tendency of the Court had been to refuse such certificates, unless it were satisfied, which it could only be by hearing evidence and examining the documents, that they ought to be granted. It might be opening the door to possible oppression on other defendants if a certificate were granted without evidence; and he must therefore decline. The judgment would be in the terms agreed upon.

WESTMINSTER COUNTY COURT—Monday, Nov. 21.

(*Before His Honour Judge* LUMLEY-SMITH, Q.C., *and a Jury.*)

Suckling v. The Gaslight and Coke Company.
Gas Poisoning, Heat Apoplexy, and Employers' Liability.

This was an action brought by Frederick Suckling against The Gaslight and Coke Company to recover damages, under the Employers' Liability Act, for an alleged injury—viz., gas poisoning—which occurred to him while engaged in assisting to discharge a foul purifier at the Beckton Gas-Works.

Mr. A. H. RUEGG, Q.C., and Mr. W. M. THOMPSON appeared for the plaintiff; Mr. H. W. LOEHNIS (instructed by Messrs. Bedford, Monier-Williams, and Robinson) for the defendants.

Mr. RUEGG, in opening the case, said that the Employers' Liability Act stated that, under certain circumstances, a workman was entitled to recover compensation from his employers, always provided he could prove there was some negligence or carelessness either on the part of the employer himself or his managers or superintendents, or those placed in authority over him. In this case, they said that the works of the defendants were in a defective state, owing to negligence on the part of one of their superintendents—Mr. T. Goulden, the Chief Engineer of the Beckton Gas-Works. He asserted that this gentleman was guilty of carelessness and gross negligence, and that the injury caused to plaintiff was the direct result of negligence and improper orders given in the first place by a foreman named Berry, and in the second place by Mr. Goulden. Among his duties, plaintiff had, with other men, to clear out the purifiers, which were about 30 ft. by 20 ft. and 5 to 6 feet deep. In doing its work, the lime which the purifiers contained became impregnated with most noxious gases; and, unless very great care was taken, the vessels became almost death-traps to the men who had to discharge them. It was safer to remove the foul lime immediately the lid was lifted than a short time after, as the action of the air rendered the lime extremely hot, and caused it to throw off dangerous gases; or if it stood for 24 hours then it became perfectly harmless. On the afternoon of Aug. 11 last, the plaintiff (who was earning £1 10s. a week ordinary wages, and £2 with overtime), with some other men, was told by Berry to clear out a purifier in No. 5 house. The men found that this particular vessel (learned Counsel did not know whether or not it was due to the hot weather) was more than usually dangerous, and that they could not work there. They saw an Assistant Engineer (Mr. J. N. Reeson), and told him the purifier was dangerous; but he said it must be cleared. They returned for half an hour, but could not keep on, and so went to refill another vessel. Then Mr. Goulden came, and said they must empty the purifier in No. 5 house; if not, he would order out his mechanics and day men to do the work. Thereupon, one of the men named Barnes said to Mr. Goulden, "If you will go and work there yourself, I will go and work by your side." But Mr. Goulden would not do that. Then another man, no doubt with the view of obtaining the commendation of the Chief Engineer, said he would go and do the work. To him, Mr. Goulden made a remark of this kind: "Ah, you are a man; the others are not." The gang could not stand such a taunt as that, and returned to the work. The plaintiff was working in one corner of the purifier; and it seemed that sometimes the draughts in the building would blow the gas more into one part of an open purifier than into others. Suckling had only been working there a few minutes, when he was suffocated, and fell down unconscious. He was taken home, and remained unconscious for nearly twenty-four hours. When he recovered consciousness, he was in the most terrible pain, and had suffered very serious inconvenience and had been unable to work since. Could the jury, Counsel asked, imagine a more proper case for damages to be paid as compensation to a workman? Here was a man who, without any fault of his own, but under an absolute threat of dismissal and a taunt, went to do the work. He (the learned Counsel) did not suppose the Engineer, when he sent him into such a dangerous place, thought he would suffer serious bodily injury. If he did, and the man had died, it would have been manslaughter. But there was grave negligence. No test was applied by the Company to ascertain whether the gases in the purifiers were dangerous to the men. That was bad enough. But when it was pointed out to him that they were dangerous, and that the men could not work there, what did the jury think of the Manager of such works who said to those men "You must go." Mr. Goulden made a terrible mistake; and, for his mistake and carelessness, it was right the Company should pay.

Frederick Suckling, the plaintiff, was then examined. He said he was 40 years of age, and had worked for the Company 17 or 18 years. His wages were 30s. a week for eight hours a day, and £2 with overtime. He had helped to clear out sulphur purifiers many times. They had orders to get into them immediately the covers were lifted; but at times they could only remove three tiers of the material out of the six, as they got stronger and hotter the lower they went. The gas was tested to see whether the vessels were foul; but no test was applied to ascertain whether they were fit for the men to work in. On Aug. 11, the gang in which he worked received orders from Berry to clear out one of the purifiers in No. 5 house; and so far as he could see, that was directly the lid had been removed. Plenty of the purifiers were left a day and night before being cleared; and they were then much better to work in, as the stuff got cool, and there was not so much smell. The material in the purifier in question was green and was steaming more than usual. There were twenty men in the gang; and he worked in one corner with two others. The first grid was very strong; and they worked at it for about half an hour, but could not stand it. They then left to see Mr. Goulden; and at first he said they might recharge another vessel in No. 11 purifier-house, which would take about two hours. He (plaintiff) told him that no man would be able to work in No. 5 after the two hours, as the lime would then be worse than it was when the lid was first taken off. But a man named Kemp who was present volunteered to get out two more layers; and Mr. Goulden said to him: "You're a man; I don't consider the others are." Mr. Goulden then said they would have to go and get the stuff out as best they could. He also heard Barnes's challenge to Mr. Goulden, and the threat of the latter to get out his mechanics and day men to do the work. The gang then went back; and after he had been working a few minutes, something seemed to "regularly draw his breath" and his inside "came up in knots," and down he went. His wife told him he was unconscious for about twenty-four hours. When he recovered consciousness, his inside was very sore; and it hurt him to swallow. He belonged to the Gas-Works Sick Club; and Dr. Pell had been attending him. He had been unable to work since; and even now he threw up nearly everything he ate or drank. His breathing was bad; and he had passed blood several times with his evacuations. When he was lying in bed, Mr Goulden went to see him. While there, Mr. Goulden said it was entirely his own fault that the accident happened; and he was sorry for it. He also offered to send him away to the seaside. Mr. Reeson was there, and two more gentlemen.

Cross-examined: Mr. Goulden and Mr. Reeson went twice to see him. Mr. Goulden said: "I am sorry this has happened; you would not have been ill if I had not asked for the work to be done." He had always worked as a purifier hand since he had been in the Company's service. He believed there were about 120 purifying vessels; and the sulphur ones were the worst to clear out. August was a very hot month; and the 11th was one of the hottest days. The gang was paid by piecework. He began work soon after six o'clock that day; and it was about three in the afternoon that they were set to clear out the purifier in question. It was not unusual for a gang to say a purifier was too hot or too strong to clear out; but he would not say that this was because the men were tired, and did not want to do it. He did not know whether Mr. Goulden went to the purifier before he saw the men; but he admitted that Mr. Goulden, said, if he considered it dangerous, he would not ask the men to do the work. Barnes said something about risking lives; but he had never heard anybody say anything about risking lives before that day. Mr. Goulden said it was necessary the purifier should be cleared out; but he did not want them to run any risk. They might, he added, take out a shovelful at a time, and then run out and have a blow; and, for the extra time taken, he would see they did not lose anything. In this vessel the stuff was very wet. None of the other men suffered any inconvenience It occasionally happened that a man was gassed; but never in his seventeen years' experience had he known of an accident such as his to happen. After the conversation with Mr. Goulden, he quite realized that the work he was going to do was dangerous.

Re-examined: They either had to do the work, or lose their bread. They were quite willing to do the work at first; and it was only after the conversation with Mr. Goulden that they went back. This was the strongest purifier he had ever been in.

H. J. Sawkins, who had worked in the purifying department at Beckton for thirteen years, and was one of the gang set to clear out this purifier, said they found it in such a bad condition that they saw Mr. Reeson about it. He said the vessel was wanted; and they must try to get the material out. They tried for half an hour; but could not go on. He had never seen a purifier so bad as this one. He confirmed the statements as to what subsequently transpired between the men and Mr. Goulden. It was usually safer to clear out the purifiers after they had been open twenty-four hours.

Cross-examined: He could not say how many purifiers were not emptied immediately the lids were removed; there might be ten in the course of the year. He did not know whether Mr. Goulden went into the vessel before he asked the men to do the work. He (witness) was only in the vessel about two minutes on the second occasion; and he was working in the corner with Suckling and another man. He saw Suckling being dragged through the doorway after the accident.

Re-examined: Two men had hold of Suckling when he saw him.

Henry Priest, who had been in the Company's employ for 19 or 20 years, and worked in the same gang as plaintiff, said Mr. Goulden might have gone into the purifier; but he did not see him. He had never before seen a man so bad as Suckling was. The purifying men were sometimes temporarily blinded. He had known the blindness to last twenty-four hours; and no one could describe the pain. This particular purifier was in a worse condition than he had ever known one to be in; and he could only take out two or three shovelsful at a time.

Cross-examined: Neither Mr. Berry nor Mr. Reeson inspected the purifier so far as he knew; and he did not see Mr. Goulden there. It was certainly a very hot day.

Stephen Groves, another purifier hand of 23 years' experience, corroborated the evidence of the previous witnesses.

Dr. *Pell*, assistant doctor to the Beckton Gas-Works Sick Club, said that when he saw plaintiff, on Aug. 11, he was in a dazed and semi-conscious condition. He was breathing heavily, and covered with cold sweats. The pupils of his eyes were partly insensible; and his hands were cold. He came to the conclusion that plaintiff was suffering from poisoning by gas fumes. In his opinion, he was suffering from gas poisoning from Thursday (Aug. 11) until the following Monday. He had given him a large number of certificates; but the wording of the certificates was not changed after the first. They were merely to show that he was still in an unfit state to work. The plaintiff had had digestive troubles since; the poisoning by gas might have weakened him. The Company had asked him for a special report; and they had subpœnaed him. He had not been paid for the report; he supposed it would come in the club work. All the certificates up to the present time contained the words "suffering from the effects of poisoning by gas." He was afraid they were in the habit of giving certificates in this way.

Cross-examined: He was not there to mislead the jury.

Mr. LOEHNIS (to Mr. Ruegg): Do you suggest the Company have got at this man?

Mr. RUEGG: I do.

Cross-examination continued: He had examined plaintiff several times lately. There were some slight murmurs over the heart; the digestive system was thoroughly out of order; but he could not find anything else now, except weakness. He had never known a case of gas poisoning in which the effects had lasted so long as this.

By His HONOUR: The effects of the gas poisoning had passed off by the Monday following the accident; and after that the suffering was chiefly due to abdominal trouble. He believed this was quite an independent thing from the gas poisoning. They were asked to give the certificates in the way they did, so as not to confuse the Club Secretary.

Re-examined: Impaired digestion did not necessarily follow poisoning of this kind.

Dr. *W. M. Leslie*, Medical Examiner under the new Compensation Act for the City of London, said he had made a special study of poisoning by accidents. He saw the plaintiff on Thursday and Friday of the preceding week, and had gone exhaustively into the case from the time of the accident. The opinion he had formed was that Suckling's condition from Aug. 11 was due to the one cause—poisoning by gas fumes or gases. There were very few objective symptoms. Of course, being a considerable time after the accident, they must take a reasonable view of the history of the case. The plaintiff's heart was very weak in action; and there was an indistinct murmur at present. The digestive system was entirely wrong; he was troubled with flatulence; and he had vomited, and had retched for two months. These things began on Aug. 11, and not before; and they were symptoms that were likely to follow an accident of this kind. The plaintiff was suffering from poisoning by a mixture of gases. One of the effects of poisoning by gases was that a certain amount of irritation remained behind; and it was this irritation that caused the digestive troubles. From the symptoms and the report of Dr. Pell, he should say plaintiff was suffering from poisoning by several mixed gases; and he should say they were sulphuretted hydrogen, carbonic oxide, sulphide of carbon, and sulphide of ammonium. When direct symptoms of asphyxiation or gas poisoning passed away, as they undoubtedly did, if the gases were of a certain irritant nature, their effect would remain much longer. In the case of carbonic oxide poisoning, the effects remained for some time; and in the case of the ammonium gas, in addition to the asphyxiation action, the irritant action, which was very pungent, also remained. An irritation of the mucous membrane continued for some time. He had no doubt these noxious gases had been inhaled by plaintiff, and had got into his stomach.

Cross-examined: The fluttering of the heart was not the only objective symptom he found. One very strong objective symptom was the absolute debility of the whole system; and the muscular weakness was a most marked objective symptom. So far as he could tell, plaintiff's sight was all right; his knee-jerks were very nearly normal; but his breathing was laboured and quickened. The plaintiff might be able to return to work in one or two months' time. The symptoms he had described were not at all consistent with heat apoplexy, the symptoms of which generally affected the head. Counsel pointed out that there was a constant inhalation of the gases by a man employed on this work, and asked witness whether, taking that into account, the symptoms were not consistent with heat apoplexy. Witness replied in the negative. He did not see why heat apoplexy should cause the heart to be in the condition of plaintiff's; nor did he see how it could cause irritation of the digestive system.

Witnesses for the defence were then called.

Dr. *A. J. Pepper*, who also examined Suckling on the 18th inst., was first called. He stated that he found the plaintiff's urine in normal condition; and there was absolutely no murmur at the heart, though it was quite possible at times there might be. An occasional murmur was not an uncommon thing; and it merely showed a functional derangement. The tongue was clean; and there was nothing to indicate that plaintiff had any difficulty in swallowing. Plaintiff told him he had still pain at the top of the head, giddiness, could scarcely sleep more than an hour at a time, and occasionally he seemed dazed. He told him he had passed blood, and that was an objective sign. But he (Dr. Pepper) found that plaintiff had piles. There was not the slightest indication from the knee-jerks that there was any disturbance of the nervous system. The symptoms of which plaintiff complained were more consistent with sunstroke or heat apoplexy than gas poisoning. The man told him he was in perfect health on the morning of the alleged exposure to the fumes of gas. Asked whether if that was the case, it did not do away with the chronic effects on the nervous system of gaseous poisoning, witness said that, if plaintiff was exposed to gas, he would not be suffering from the nervous system some time afterwards; but he might be in the case of chronic exposure—after he had been repeatedly and gradually gassed. Irritant effects lasted a long time with sulphurous acid; but he did not think the same would occur here. He did not know a case of gas poisoning that would produce the effects complained of by plaintiff.

Cross-examined: The doctor who first attended Suckling would have to depend largely on the patient's statements. He attributed the symptoms described in Dr. Pell's report to some other cause than gas poisoning. The patient would not have suffered from the abdominal symptoms all this time afterwards; they would have vanished in about a week. They were dependent very much upon the subjective symptoms—those which the patient described himself. Nine times out of ten, a patient could deceive a medical man if he chose; but he had no reason for thinking Suckling had not told him the truth.

Re-examined: In the case of a man who was getting worse day after day and month after month at his work, the effects would be more permanent than in a sudden attack of this kind. So far as he had been able to see, plaintiff was at present fit to go to work.

Dr. *George Hastings*, consulting surgeon and physician to The Gaslight and Coke Company for twenty years, said he had had a large experience of these gas poisoning cases. He had examined Suckling in every way; and he did not think that gas poisoning had any relation to his present weakness—in fact, he was unable to find any physical signs to account for the weakness of which he complained. He thought plaintiff had been suffering more from a heat stroke than anything else. In the case of gas poisoning, a man should, if he did not die, be perfectly well in twenty-four hours. Gas poisoning would produce abdominal pains; but they did not last so long as in this instance.

Cross-examined: If the man inhaled a great deal of the gas, it would for the time being affect the digestive organs; but the length of time would depend upon the man's general condition and the nature of the gas. Carbonic oxide was not very irritant, but deadly; nor was sulphuretted hydrogen very irritant.

Dr. *Beaumont*, who was the first doctor to see plaintiff after the accident, said he came to the conclusion that he was suffering from the heat. He had not had much experience of gas poisoning, as the men seemed to recover before a medical man could get to the works.

Cross-examined: He had never known a man to be unconscious through gas poisoning for twenty-four hours. Supposing plaintiff had inhaled a considerable quantity of sulphuretted hydrogen, carbonic oxide, and sulphide of ammonium, that would have been an irritant mixture, and might cause sickness.

Mr. *T. Goulden*, the Chief Engineer at Beckton, said he had been in sole charge of the works during the last two years, and altogether had been on the works nearly fifteen years. For some years, he had the purifiers (of which there were fifteen sets of eights) under his entire control. The Company were under regulations as to the amount of sulphur the gas might contain as distributed. In summer it was 17 grains per 100 cubic feet of gas; and in winter, 22 grains. No. 5 purifier-house contained sets Nos. 7 and 8; and on Aug. 11, it was ascertained that No. 7 was passing 31 grains of sulphur. This indicated that the sulphur vessels in this particular set were no longer in a condition to do their work, and would have to be changed. These particular boxes were put into operation on June 21, and on Aug. 11 had been at work 1314 hours, which was rather below the average. On the afternoon of that day, he was informed by Berry that the men declined to discharge one of the sulphur purifiers in No. 7 set. He asked Berry whether the men considered they had had enough work to do that day; and he replied that he really thought that was the reason. He went down with Berry to see the vessel, stepped on to the top tier, and came to the conclusion that its condition was normal. He saw Mr. Reeson, who informed him that the men had previously that afternoon refused to empty the box. He (witness) then interviewed the men, who said the vessel was hot and dangerous; but, having seen it himself, he took it that was their method of telling him that they had done enough work for the day. He pointed out to them the urgency of the purifier being emptied, owing to the state of the sulphur, and also mentioned that he had seen it, and really could not detect anything dangerous in it. Then followed the so-called challenge from Barnes; and his (witness's) remark that he must, if necessary, get the mechanics and day workmen to do the job. He further informed the men that, if they considered the vessel dangerous, they could take out a shovelful of the material at a time, and have a blow in the fresh air; and he would see they did not lose anything by the longer time they took to do the work. One man volunteered to try; and the others followed his example. The day was very hot; the temperature being 10° higher than the day before. Some 232 sulphur vessels were cleared out in the past twelve months; and certainly not more than half a dozen were not emptied immediately the covers were removed. In his whole experience, this was the only instance he had come across of a man being overcome in purifying work. The sulphur vessels were unpleasant things to deal with; but the men were well paid. There was only about 4 to 5 per cent. of carbonic oxide in the coal gas they produced. He visited Suckling's house on three occasions. The first time Suckling was lying in an absolutely unconscious state; and he told his wife that he was sorry for her husband's accident. Knowing she had a large family, and in view of the fact that it was by his (witness's) personal urgent orders that Suckling entered the vessel and met with the accident, he asked to be allowed to give her some little assistance during his illness. He also said that, when Suckling got better, he would see what he could do towards sending him to the seaside. He did not say that the accident was entirely his (Mr. Goulden's) fault; he took every precaution he possibly could take. He considered an unwarrantable use had been made of what he intended to be a charitable action.

Cross examined: He thought now, as he did on Aug. 11, that the vessel was in a fit state for the men to work in. When the men said the vessel was dangerous, he did not think they appreciated what they were saying. In his opinion, Suckling had had a hard day's work; and the work, combined with the heat of the day, proved too much for him. He did not suggest to the doctors that this was a case of sunstroke, and not gas poisoning. His experience was that men who had been gassed began to recover directly they were removed from the suffocating influence of the gas. He was not present when Suckling fell. Asked what he meant by saying that it was in consequence of a "direct order" given by him if it was a case of sunstroke, he said that, as a general rule, he did not give his orders personally. He did not say anything at Suckling's house about his opinion that it was a case of sunstroke or heat apoplexy, because he did not see any need for general discussion by him on the matter. The man was not fit for the job; but having sent him into the purifier, he felt a certain responsibility. He did not suggest to Dr. Pell that he was making a mistake in stating on the certificate that Suckling was suffering from the effects of gas poisoning. He still believed that, when the men said they were carrying their lives in their hands, they were playing a

part, and did not want to work. Suckling was a steady workman. He would not admit that it was because he thought the purifier dangerous that he suggested the men should go in and take out a shovelful at a time; but he told them they could do so if they considered it dangerous. It was unnecessary to take any special precautions to discover the state of the lime before the men entered the purifiers. This particular vessel measured 36 feet by 21 feet. It seemed to him that they would now, in consequence of the new Act, have the greatest difficulty in doing their purification work.

Re-examined: In a report which he made on Aug. 13, he stated that Suckling was overcome by heat. He had stood in a purifier twenty minutes after men had said it was not fit to put a dog in.

Mr. *J. N. Reeson*, the Assistant-Engineer, stated that he saw the vessel before the men went into it the second time, and entered it after the accident; and its condition was quite normal. There was nothing which indicated the presence of any dangerous or noxious fumes.

Cross-examined: After the accident, nothing more was done that day; but the box was emptied next morning. The men went to him directly the cover was removed, and asked if the work might be left until the following day. But he pointed out to them that it was urgently necessary the vessel should be refilled that day. To the best of his recollection, they did not say anything about the lime being in a dangerous condition.

Mr. *Berry*, the foreman, also asserted that he did not notice any difference between the condition of this vessel and others. He saw Mr. Goulden go into the purifier before his interview with the men; and after the accident, he (witness) spoke to Suckling who was then conscious. The men did not object when he ordered the purifier to be cleared; and, speaking generally, he had no fault to find with the gang. If a sulphur vessel was strong and hot, it would be his duty not to let the men go into it, but communicate with Mr. Goulden or Mr. Reeson.

Mr. *Hamilton*, a valveman, corroborated the last two witnesses' evidence as to the state of the purifier, having entered it after the accident.

Mr. *Pendry* was called by Mr. RUEGG; and he declared that on Aug. 22 he was at Suckling's house at the same time as Mr. Goulden, who made the remark that it was by his orders that Suckling went into the purifier, and, if he (Mr. Goulden) had known the state of the vessel before, he should not have sent him.

Cross-examined by Mr. LOEHNIS: He was the local Secretary of the Gas Workers' Union.

Mr. LOEHNIS: This is my friend's independent witness!

Mrs. *Suckling*, also examined by Mr. RUEGG, stated that on Aug. 22, Mr. Goulden said to her: "Mrs. Suckling, I am extremely sorry to see Mr. Suckling lying as he is. If there is anything in my power I can do for your family, I shall do it with the greatest pleasure. It was my own fault. The men complained about this vessel; and I really thought they were tired and wanted to leave it. But I was obstinate, and meant to have it done."

Mr. LOEHNIS, in addressing the jury, asked them to bear in mind that, as the law now stood, there was no necessity for juries to allow their judgment to be warped by a feeling of sympathy towards working men, because, by the Act of 1897, a plaintiff was entitled, whether there was negligence or not on the part of his employers, to obtain that compensation which the law said was fair for an accident occurring to him in the course of his employment. It was conceded by the defendants that there was compensation to which the plaintiff was entitled, whether there was evidence of negligence or not. According to Dr. Leslie, plaintiff would be able to return to work in two months' time, which made a total withdrawal of 21 weeks from work; and his wages for that period would be between £40 and £50. The Company were not there to discuss whether the man should have £40 or £50; but the action was being fought because it had pleased those who were instructing his learned friend to make an attack upon the system that was in force at the gas-works. The only course the Company could take was to come into Court and vindicate the judgment, care, and diligence of their officials. He maintained that there was no evidence of negligence on the part of Mr. Goulden or the other officials on that occasion. Of the twenty men who went into the purifier, only one was attacked; and, after the accident, both Mr. Reeson and Mr. Hamilton went into the box, and found nothing about it out of the normal. In the course of further remarks, he said that plaintiff was claiming £300.

Mr. RUEGG followed, contending that this was a very bad case of negligence on the part of the officials of the Company, which negligence was made much worse by the obstinacy with which it was persisted to the end that the view taken by Mr. Goulden (who was the sole cause of the plaintiff's injury) was a proper and fair one. At one time he acknowledged his mistake, and was anxious to do what he could to remedy it; but now the jury were asked to acquit him of negligence. He (the learned Counsel) said deliberately that the way the Company had defended the case did them little credit. The theory that the plaintiff was suffering from heat apoplexy was put forward by Mr. Goulden entirely for the purpose of excusing himself, notwithstanding Dr. Pell's certificate that Suckling was suffering from poisoning by gas. All risks of similar accidents could be avoided by the Company providing more purifiers. He asked the jury to accept Dr. Leslie's evidence, which was fair and reasonable.

His HONOUR, having summed up the evidence, put the following questions to the jury: (1) Was the vessel dangerous for the men to work in? If so (2), was Berry guilty of negligence; (3) was Reeson guilty of negligence; and (4) was Goulden guilty of negligence in ordering plaintiff to resume work? If so (5), was the accident caused by reason of negligence. (6) Did the plaintiff know and appreciate the risk of resuming work? (7) If he is entitled to compensation, state how much.

The jury retired for a short time to consider the questions. To the first five, they replied in the negative; and to the sixth in the affirmative. The seventh was answered by an award to plaintiff of £40.

His HONOUR: That is a verdict for the defendants.

OTLEY PETTY SESSIONS COURT—Tuesday, Nov. 22.

(*Before Mr.* T. DUNCAN *and other Magistrates.*)

The Assessment of the Shipley Gas Company's Mains.

This was an appeal by the Shipley Gas Company against an assessment made upon them by the Assessment Committee of the Wharfedale Poor-law Union in respect of certain property in the parish of Baildon.

Mr. BEVERLEY represented the appellants; Mr. J. J. WRIGHT appeared for the respondents.

Mr. BEVERLEY, in opening the case, said the rates for the current year for Baildon amounted to 7s. 4d.; being 2s. 4d. for poor-law purposes and 5s. for general district rating purposes. In respect of this rate, a demand was made upon the Company on an assessment basis of £405 per annum for the rating of the gas-mains in Baildon. The previous net annual rateable value fixed by the Assessment Committee was £313 4s.; and it had stood at this figure since 1889, so that there was an increase by the latest charge of little less than £100. Prior to 1890, the assessment had for a number of years been £225. For some time the Assessment Committee appeared to have adopted a rising scale without rhyme or reason. His clients had stood this until they could stand it no longer; and having regard to the circumstances, they determined to appeal. In May last the Company gave notice to the Assessment Committee that they would appeal on the ground that the assessment was in excess of the value, and had not been made upon a proper basis. The appellants came before the Committee on May 27; and the Committee agreed to reduce the net rateable value to £375. His clients were not satisfied. The Assessment Committee seemed to go upon a hypothetical notion that, as time went on, profits must increase; and therefore the rateable value ought to go up. The Overseers had not acted upon facts or figures; for no information whatever had been asked for by them or given to them. The reason why the appeal was made to this Court instead of to Quarter Sessions was that it was the cheaper Court of the two available to an appellant. After the Assessment Committee had reconsidered the matter, they were served with notice of appeal on the ground that the valuation was excessive, was not based upon any principle, and, as compared with other property of a similar character, could not possibly hold good. By the ordinary method of calculation, the net amount of the assessment should be £284.

Mr. *Wheater Smith*, valuer, said he had gone carefully into the question of the apportionment of rateable value in the case of the Company; and, taking the published balance-sheets as accurate, he had worked out the figures on the recognized basis. Upon his calculation the net rateable value was £284.

Mr. *T. G. Wilcock*, Secretary and Manager of the Company, proved the accuracy of the figures which had been given to Mr. Smith.

Cross-examined: The receipts of the Company had increased from £15,747 in 1890 to £19,561 in 1897; and the profits had increased from £6410 in 1890 to £7405 in 1897. But he added that the expenditure and capital had both correspondingly increased.

Mr. *William Glossop*, called on behalf of the respondents, said in 1897 the net takings at Baildon were about £3250, which was 16 per cent. of the total amount. Having regard to the figures, his opinion was that, taking into consideration the increase in the turnover—some proportion of which must have come from Baildon—a fair assessment would be about £400.

Mr. *John Waugh* considered that, if £2512 net income in 1890 was liable to be charged £313, then £3251 net income in 1897 was clearly liable to a charge of £405. The expense of maintaining gas-mains was a very small matter.

Cross-examined: He believed he was entitled to regard the Baildon mains as a separate concern altogether; and there was no difficulty whatever in separating the Baildon distributing works from the Shipley productive works.

Mr. WRIGHT, on behalf of the repondents, held that if an occupier was putting more money into his pocket, the representatives of the public had unquestionably the right to have more in the way of rates. The true proportion of increase since the figures of 1889 was shown with absolute clearness by Mr. Waugh's calculation.

Mr. BEVERLEY contended that since 1847 the practice in making these assessments had been to take the whole value of an undertaking as the first figure. The point raised by Mr. Waugh was not a new one, but had been raised again and again, and had always been set aside. He thought that, on the evidence before them, the Magistrates could only come to the conclusion that the judgment of the Assessment Committee should not be upheld.

The Magistrates retired to consider their decision; and subsequently both witnesses and Counsel had a private consultation with them. On returning into Court,

Mr. BEVERLEY said that, on behalf of his clients, and with the consent of his friend Mr. Wright and his clients, he had to state that, after seeing the Magistrates privately, they had agreed to a compromise upon the suggestion of the Bench. They had determined that the present assessment should be reduced to £340; and the parties should pay their own costs of appeal—the respondents undertaking, as far as they could bind the Overseers, not to disturb the agreed assessment of £340 during the next three years.

The Rossendale Union Gas Company's Assessment Appeal.

At the Preston Adjourned Quarter Sessions last Friday, the appeal of the Rossendale Union Gas Company against the rating of their works by the Assessment Committee of the Haslingden Union came before Mr W. H. Worsley Taylor, Q.C., and other Magistrates. The amount of the assessment in question was originally £7871; but this was reduced by the Committee to £7477. The assessment of the Company down to the present year was upon a valuation made in 1888 on the Company's accounts for 1887; and the total brought out was £6359. The difference between this sum and the £7477, the subject of the appeal, was accounted for by the fact that in 1888 the township of Spotland was partly in the Rawtenstall and partly in the Haslingden Union, and that it has since been entirely included in the latter. Mr. Bradbury (who, with Mr. M'Keand, appeared for the respondents) opened the case; and evidence was given by Mr. J. Cross, of Manchester, Mr. H. Edge, of Blackburn, and Mr. T. T. Wainwright, of Liverpool. On the following day, the last-named gentlemen were re-examined; and the respondents' case closed. Mr. Sutton (who, with Mr. Formby, represented the appellants) called Mr. T. Newbigging, who gave evidence at some length. He was followed by Mr. Corbet Woodall, at the close of whose examination the further hearing was adjourned until to-morrow. A complete report of the proceedings will appear next week.

MISCELLANEOUS NEWS.

OPENING OF NEW GAS-WORKS AT CARLUKE.

The thriving little Lanarkshire town of Carluke was the scene last Tuesday of a ceremony which is unique in places so small—in the inauguration of an entirely new gas-works, upon a fresh site. Such transfers of works have been common of late years, but always in bigger towns. The necessity for such movements is testimony to the fact that, in the early days of gas making, the dimensions which the industry would attain were not realized; and the circumstance that owners of gas-works are unhesitatingly removing them to places where they will have better facilities for working, and more room to extend, must be taken to indicate that the present day leaders in the gas world are fully persuaded of the continued advance of the industry.

For some time back, the Directors of the Carluke Gas Company, Limited, have experienced great difficulty in giving an adequate supply of gas, owing to the antiquated state and the cramped position of their old works. All the available ground under their existing lease was fully taken up; and being situated in a hollow, with the ground rising on either side, no suitable space could be obtained for future extensions. The Company was formed in 1834, with the modest capital of £600. Additions have been made from time to time, until at present the capital of the new Company stands at £5000. Since 1888, the consumption has increased about 120 per cent., which necessitated a radical change both in the manufacturing and distributing plant. About two years ago, the Directors asked Mr. Alex. Yuill, of Alloa, to give them a report on the position and future requirements of the works. After reviewing the whole circumstances of the case, Mr. Yuill strongly advised them to procure ground situated at Law Crossings, contiguous to both the Caledonian Railway and a branch communicating with the North British Railway. The Directors unanimously agreed to erect new works as recommended. The first sod was cut by Mr. Pillans, the Chairman of the Company, in the spring of this year; and the gas was turned on to the town from the new works last Tuesday by Mrs. Pillans, before a representative gathering of contractors and local gentlemen.

The retort-house is built wholly of brick, with panellings outside. It measures 59 feet by 56 feet, with accommodation for local storage. A branch line from the Caledonian Railway goes right through the retort-house, where the coal is deposited direct from the trucks. The retort-bench contains three ovens, in settings of six, four, and two retorts. The oven of four retorts is of such a size as will admit six retorts at any time when required. There is also space for other two ovens of six retorts, which, when complete, will give 26 retorts in all. The retorts are set on Mr. Yuill's principle of forced draught. The primary air pipes are placed between the exit-flues, whereby the primary air is heated by the products of combustion as it leaves the setting. The secondary air flues are so arranged as to have the benefit of the heat from the exit gas flues on both bottom and side, and also on the other side by the side walls of the producer itself. A Cornish boiler, measuring 14 feet by 4 ft. 6 in., is placed in the retort-house in line with the retort-bench, for the generation of steam both for the engines and for the retort settings. A square chimney, of decorated style, 70 feet high, is situated at the rear of the retort-house. The hydraulic main is of steel, and rests on stools and cross-girders connected to the front and back bench binders. The condensers are of the ordinary box and vertical pipe form, with bridge pipes at top. They are so arranged and controlled with valves, that the gas may be admitted at either end as may be desired. The deposited tar liquor is removed from the bottom of the box to a seal-box placed at one end, wherein also the tar and liquor deposited in the hydraulic main is collected, so as to prevent it finding its way into the condensers. The whole tar and liquor collected from the various apparatus is stored in an underground cast-iron tank, from which it is pumped by a Tangye's special pump into tank-waggons. The exhauster is of Messrs. R. Laidlaw and Son's newest form, driven by their ordinary make of steam-engine, all on one bed-plate. The engine is controlled by the gas itself, and is so arranged as to increase or lessen speed according to the varying make of gas. The connections are fitted with the usual bye-pass and compensating valves. The scrubber is of Young's form, and is constructed of steel plates with six washing divisions of the ordinary form. The purifiers are four in number, measuring 10 feet square by 4 ft. 6 in. deep, and controlled by one of Weck's patent centre-valves. The lime-shed adjoins the purifier-shed, and is so arranged that the lime-shells are taken direct from the trucks. The spent lime may either be loaded direct into trucks or removed for storage. The station meter, by Messrs. James Milne and Son, Limited, is cylindrical, having a measuring capacity of 7500 cubic feet per hour. It is fitted with stop and bye-pass valves, gauges, and water overflow arrangements. The gasholder, erected by Messrs. Clayton, Son, and Co., Limited, measures 60 feet diameter by 20 feet deep. It is of 57,000 cubic feet capacity, and is constructed of mild steel throughout. The columns are of cast iron, with steel lattice girders. The gasholder tank is constructed of brick, grouted with cement mortar, and backed with puddle. The governor is one of Messrs. W. & B. Cowan's well-known type, with bye-pass valves. An 8-inch main had to be laid from the new works to the town, a distance of about 1700 yards; and other alterations were made on the existing pipes to improve the supply generally over the town. A new commodious residence, with office for the Manager (Mr. T. Peacock) has also been erected.

The company were shown over the new works by Mr. Yuill, after which the gas was turned on in the governor-house by Mrs. Pillans, the wife of the Chairman of the Company. Mr. Pillans subsequently entertained those present at dinner. After the loyal and patriotic toasts had been drunk, Mr. J. Hepworth, of Edinburgh, in the name of the Contractors, presented the Chairman with a set of cutlery, and with a gold bracelet, set with diamonds, for Mrs. Pillans. In proposing the health of the Engineer, the Chairman complimented Mr. Yuill on the successful conclusion of his work, which had been carried out without a hitch. Mr. H. O'Connor, of Edinburgh, acknowledged the toast of "The Contractors." In replying to the toast of "The Officials," the Secretary of the Company (Mr. J. J. Wilson) said that, while in other similar places the price of gas ranged from 3s. 9d. to 5s. 5d. per 1000 cubic feet, in Carluke it was only 3s. 4d. per 1000 cubic feet. Besides this, the Company supplied gas for the street-lamps free of charge.

REIGATE CORPORATION AND THE GAS COMPANIES.

The many conflicting statements which recently appeared in the local papers on the question of the proposal of the Reigate Corporation to purchase the Reigate and Redhill Gas Companies had the effect—and naturally so—of raising considerable doubt among the ratepayers as to the wisdom of proceeding with the scheme. In order that he might get an independent judgment on the subject, the Mayor (Mr. F. E. Barnes) submitted to Messrs. Stevenson and Burstal all the published statements; and they reported thereon in a letter dated the 11th inst. It appeared to Messrs. Stevenson and Burstal that the whole gist of the opposition was that there was a probability of the Council not making a profit on the purchase. They noticed that at a Council meeting the Mayor spoke of the purchase-money as being probably £161,000 (*ante*, p. 981). They thought this was somewhat less than the value of the undertakings. They also said that at the public meeting of ratepayers, Mr. Viall considered it would be better to take the opinion of Mr. George Livesey, who, according to him, had put the purchase price as likely to be £217,000. Assuming this—and in so doing they were taking the worst aspect for the Council—it meant that, borrowing the money at 2¾ per cent., the multiplier would be 0·0415 for each pound to pay the interest and repay the loan at the end of forty years. Then £217,000 multiplied by 0·0415 equalled £9005. Turning to the balance-sheets of the Companies ending, Redhill, December, 1897, and Reigate, June, 1897, Messrs. Stevenson and Burstal found that the profit earned by them amounted to £8236. To this had to be added £750, being Directors' fees; making a total profit accruing to the two undertakings of £8986. This very nearly approximated to the amount the town would have to pay in interest and sinking fund. There was no doubt, however, that great economies could be effected if the amalgamation were carried out and improvements made in the manufacture of the gas, which should be apparent to everybody; and they estimated that these two matters would effect a further saving of at least £1000 a year, making a total of £9986 profit, without allowing for any increase in the business of the undertakings. This, therefore, showed a clear profit to the borough of £981 at once. This could be used either in the reduction of the rates of the town or in the reduction of the price of gas equal to 2d. per 1000 cubic feet all round. Any increase in the business (which was very great in the district) would be met by constructing works, the capital expenditure upon which would carry less interest under the Corporation than under the Companies, and would thus further tend to augment the profits to the borough. This report was communicated to a recent meeting of the Town Council; and the Mayor was authorized, by 10 votes to 7, to consult Messrs. Stevenson and Burstal, and issue a statement, if he thought desirable, to the ratepayers before taking the poll, in order to show why the Corporation should be empowered to purchase the works.

SALES OF STOCKS AND SHARES.

At the Mart, Tokenhouse Yard, last Wednesday, Mr. Alfred Richards offered for sale, in accordance with instructions received from the Directors, £15,000 of new stock, 1831, of the Brentford Gas Company. It ranked for a standard dividend of 7 per cent. per annum, subject to the sliding-scale; the last dividend on similar stock having been at the rate of 9 per cent. per annum. It was put up in 140 lots of £100 each, and 20 lots of £50 each. The first lot offered fetched £206 10s.—the highest price realized; the last selling at the rate of £206 per cent. The lowest figure was £200; the average was £201 6s. 1d.—yielding £4 9s. 5d. per cent. on the investment—the purchasers taking the dividend accruing from Jan. 1 next. The total amount realized by the sale was £30,195 7s. 6d. On the following day, Mr. John Hunter offered for sale by auction 300 £10 shares in the Hartlepool Gas and Water Company; being part of the gas capital authorized to be issued by the Company's Act of 1878. The prices realized ranged from £19 2s. 6d. to £20 each. An important sale of £25,000 of new stock of the Sunderland and South Shields Water Company took place on Wednesday, at the Queen's Hotel, Sunderland; the auctioneer being Mr. Atkinson Gibson. The highest price realized was £134, the lowest £126 10s. per £100 of stock. A few fully-paid £10 shares in the Altrincham Gas Company have lately changed hands, at a sale by auction, for £23 each. A small parcel of stock of the Plymouth and Stonehouse Gas Company was sold by auction last Thursday at the price of £150 per £100 of stock. A few additional shares in the same Company fetched from £23 15s. to £24 2s. per share. Messrs. Kidwell and Sons disposed last Tuesday of some fully paid £20 shares in the Sittingbourne and District Gas Company at £33 10s. each. Eleven new £20 shares, £10 paid, were offered at the same time; three realizing £17, and the remaining eight £16 15s. per share. On Friday several lots of £10 original shares in the Eastbourne Gas Company changed hands at prices ranging from £37 7s. 6d. to £36 15s. each. Two £10 "C" shares realized £37 2s. 6d.; and two lots of six and five £10 "B" shares were sold at the rate of £27 2s. 6d. and £27 15s. respectively.

The Future Control of the Metropolitan Water Supply.—The "Pall Mall Gazette" says the Battersea Vestry have provided a strong argument against control by the County Council of the water supply, and an equally strong one in favour of a Water Trust or other central authority. A circular sent out by the Vestry to the other Vestries and District Boards, inviting their views, has resulted in a practically unanimous affirmation of the suggestion that there should be a central authority; but on the question of what that authority should be, there is remarkable divergence of opinion. Ten Vestries and District Boards favour the Council as the controlling authority, but eighteen are in favour of an authority other than the Council. The ten represent a population of 1,472,623, a rateable value of £8,096,266, and an acreage of 15,467; whereas the eighteen represent a population of 1,556,483, a rateable value of £12,863,723, and an acreage of 28,301. Our contemporary points out that the balance of opinion is thus against the Council, even on this partial poll. As to the balance of fourteen Vestries and District Boards, it may be fairly assumed that they, too, would be against Spring Gardens. It is thought that "this ought to satisfy even Mr. Dickinson that the people will not stand a County Council water monopoly."

THE TESTING OF GAS AT COVENTRY.

A discussion on the gas-testing arrangements of the city occupied a large part of the time of the Coventry City Council last Tuesday. It appeared that an application having been made by Mr. E. G. Clayton, the Gas Examiner, for an increase in his remuneration, the Watch Committee considered it a convenient opportunity to revise the present system, and to have future tests made at a point in the centre of the city. They accordingly recommended that Mr. Clayton be invited to resign his office at the termination of the current year of his engagement in May next, and that arrangements be made with Professor Belcher, the Principal of the Technical Institute, to carry out tests in his laboratory, which, in the opinion of the Committee, is favourably situated for the purpose. The adoption of the report was moved by Alderman Tomson, who explained that up to the present the gas had been tested at the works; but, as the consumers were not thoroughly satisfied, the Committee had come to the conclusion that tests should be made in the heart of the city. The motion having been seconded, Alderman Andrews, the Chairman of the Committee, moved the rejection of the report. He protested against the Master of the Technical Institute being placed in what would be nothing more nor less than the position of a referee or arbitrator of the quality of the gas. Their Acts prescribed that the gas should be tested at the works; so that the testing of it in the centre of the town would have no legal value. They had to supply gas of 15-candle power; but in order to ensure that the light should be of the proper standard, they made 17-candle gas. Supposing the illuminating power was found to be deficient at the Technical Institute, and a demand was made upon the Committee to increase it, it would cost between £2500 and £3000 a year to raise it from 17 to 18 candles, which would alone knock the bottom out of their surplus profits. Mr. Robinson remarked that, in suggesting that the proposed testing would increase the cost of manufacture, Alderman Andrews gave away his case; for, if the Committee were not supplying gas of the required quality, they ought to be. The Town Clerk, in answer to a question, said there was nothing in Gas Acts to prevent the testing of the gas in the centre of the city. In replying to a long discussion, Alderman Tomson said the Watch Committee quite believed the Gas Committee were giving gas of higher illuminating power than the statutory requirement; and there was no general dissatisfaction. The report was adopted by eighteen votes to nine.

BIRMINGHAM CORPORATION GAS UNDERTAKING.

A Member of the Committee on Its Past and Present Position.

An intimate association with the Birmingham Corporation Gas Department, as a member of the Gas Committee of some years' standing, enabled Mr. STEVENS, in an address to his constituents of St. Thomas Ward last Tuesday, to give some figures which, as they strikingly illustrate the progress of the concern, are worth recording.

Mr. Stevens, in the course of his address, said the income of the Gas Department last year was nearly £665,000; and the expenditure was £610,000, of which £100,000 was interest on and repayment of capital. The amount paid over to the improvement rate was close on £55,000, including £4000 interest on the reserve fund, which had by statute to be so applied for so long as the reserve fund was not drawn on. In addition to this £55,000 in cash, the rates were relieved to the extent of an additional £11,500 in the lower prices charged for public lighting; and for court lighting further relief was given amounting to £2500. An additional £3500 went to the relief of rates in districts outside the city in which public lighting was also charged on the reduced scale; so that in round figures, the total amount contributed to the relief of rates and in aid of court lighting in and outside the city was £72,500. In the last three years the Gas Committee had provided nearly £125,000 in cash in aid of the rates, and had relieved the charges for public lighting in and outside the city to the extent of £50,000. Since the transfer of the undertakings to the Corporation, the total profit earned had been above £1,000,000. In that time £650,000 had been contributed in relief of the rates; a reserve fund of £100,000 had been formed; £230,000 had been applied, beyond the sum required to be set aside by the Act of Parliament, for repayment of capital; and nearly £40,000 had been expended on providing the Art Gallery building. Visitors to that gallery should always remember that it was only by the assistance of the Gas Committee in providing rent free the spacious galleries in which the art treasures of the city were stored, that it had been possible to take advantage of the munificence which had since furnished those galleries. During this period, the total relief given in reduced prices on public lighting had been no less than £180,000. From the transfer of the undertaking to the present time, the annual sale of gas had increased from 2300 million cubic feet to above 5000 millions; and the quantity of coal carbonized had advanced from 300,000 to more than 500,000 tons per annum. The price of gas had been reduced in the same period by 1s. per 1000 cubic feet; the reduction made in the present year being equal to £30,000 per annum. The capital expenditure at the date of the transfer was £2,000,000; it was now £2,200,000. The capital expended worked out in 1876 to £7 per ton of coal carbonized; while now it was less than £4 10s. per ton. The interest on capital (which, of course, formed a part of the charge made for gas) was equal to 9d. per 1000 cubic feet; last year, it was equal to 5d. per 1000 cubic feet. Moreover, there was more gas made per ton of coal carbonized now than in 1876. There was also less leakage from mains and service-pipes; and only one set of distributing mains was now required, as against two in the days of the Companies. There had also been great economies effected by the introduction of modern methods of manufacture and savings in management, such as in Directors' fees, cost of collection, bad debts, &c. Management expenses in 1876 equalled a charge of 1d. per 1000 cubic feet of gas sold. Now they represented less than ½d.; and this saving amounted on the total output of to-day to about £9000 a year. During the past three years, there had been a phenomenal increase in the output of the undertaking, due very largely to the rapid introduction of gas-engines for manufacturing purposes. This had led to the large extensions of the works now in progress, and on which some £400,000 was gradually to be spent. There was another modern development of the gas industry which, if not so profitable, was likely to be productive of great benefit to the community—*i.e.*, the introduction of gas to the dwelling of the artisan by means of prepayment meters. The Gas Committee had found that, with extreme care and good organization, they could make this system self-supporting, although they could not hope for many years that the profits on it would be sufficient to swell appreciably the aid to the rates. There were now nearly 5000 of these meters in use in Birmingham; and there were unexecuted orders on the books for about 1000 more. The great difficulty the Committee had met with was the impossibility of getting the help of enough fitters to keep up with this work in the winter; but the Committee were doing all they could by soliciting the help of outside gas-fitters to cope with the demand. These 5000 consumers represented an additional consumption of about 50 million cubic feet per annum, and 5000 additional tons of coal a year to be carbonized; while it involved a total capital expenditure for fittings of all kinds of about £25,000. Nearly the whole of this expenditure had gone to benefit Birmingham traders and their employees. In the great success that had attended the working of the gas undertaking, the cause of the workers had not been overlooked. At the time of the transfer, the men in the retort-houses worked twelve hours per day; they now work eight hours When it was necessary for them to work on Sundays, they were paid at the rate of time-and-a-half. The men's wages all round had been advanced; while their hours had been reduced. The permanent men received a week's holiday during the year, and their wages as usual; the short-term men had holidays in proportion to the time worked. In addition to this, the conditions under which the men laboured had been much improved. It was estimated that the concessions made to them cost the department no less than £45,000 per annum. Mr. Stevens expressed his surprise that Birmingham manufacturers were so slow to avail themselves of their exceptional facilities for making gas meters and stoves. Birmingham supplied the parts to many outside makers of such apparatus; and it was curious that more local manufacturers did not occupy the field for themselves by turning out the complete article. Other municipal topics were also dealt with.

THE FALMOUTH CORPORATION AND THE GAS AND WATER WORKS.

The Purchase Scheme Again Rejected.

A poll of the ratepayers of Falmouth was taken last week on the proposal of the Corporation to promote a Bill in the ensuing session of Parliament, empowering them to acquire the undertakings of the local Gas and Water Companies. The votes were counted on Thursday, when it was found that 873 had voted for the scheme and 1238 against it—being a majority of 365 against. Of 2671 papers sent out, 2227 were collected; and of these 361 were blank and 50 invalid. The number of good votes recorded was 211.

The taking of the poll was preceded by a public meeting held on Monday evening, the organizers of which were the opponents of the scheme, who were closured by the Mayor at the statutory meeting. Mr. E. Trerise presided, and contended that the purchase of the gas and water works would not benefit the ratepayers. It was misleading for the supporters of municipalization to say that in 208 places in the United Kingdom, where the gas-works were the property of the Local Authority, there were profits available for the relief of the rates. The other side of the story showed that in such places as Manchester, Salford, and Oldham, where there was a large profit, possession of the works was obtained thirty or forty years ago; they were near coalfields; the localities had grown enormously; and much of the original capital and interest had been paid off. If it was such a good thing as the promoters wished them to believe, why had not Plymouth, Devonport, Torquay, Exeter, Bristol, Bath, Taunton, and many other big towns, thought it wise to obtain possession of their gas-works? Even if there were a profit, the majority of the working men would not benefit, because a large proportion of them did not use gas. Should the scheme be carried at the poll, what guarantee had they that the management of the properties by the Corporation would produce successful results? Both the gas and water works were well managed, and he thought they had better leave them alone.

The next speaker was Mr. R. Fox, who suggested that the best friends of the shareholders of the Gas Company were those members of the Town Council who advocated buying up the undertaking. Since the scheme was introduced, the shares, which had before been standing at from £2 10s. to £2 14s., had sprung up to over £3. If the purchase scheme was defeated, the value of the shares would, he believed, decline. He was of opinion that the ratepayers would get no practical benefit from the purchase of the gas-works; while as to the water-works, even Mr. Silverthorne thought they would be a loss. There were things in connection with the water—such as the improvement of the works, the renewal of the mains, and the settlement of water rights—which would mean perhaps great expense. The time might come when it would be advisable to purchase the water-works; but before then an arrangement should be entered into with their neighbours at Penryn, so that the scheme might be a joint one.

Speaking as a shareholder in the Gas Company, Major Mead said the principle of the transfer of the gas-works was settled when the Company agreed to embody in their Act of Parliament a clause by which they were bound to sell their works any time within ten years. The Company were willing to leave the matter in the hands of valuers as provided by the Act; but shareholders were being led to suppose that they would be robbed of their own, and the ratepayers that they would get the works for something like half their value. On the basis of transfer schemes in other places, he was of opinion that the gas-works would cost the town £68,000; and at this price the result would be an annual loss of £941. Personally, he advised the Company to sell, because they would do so at an enormous profit. Another shareholder (Mr. F. J. Bowles) said there were advantages arising from the possession of the water supply; but were they prepared to pay for them? Assuming that it would cost over £100,000 to acquire the two undertakings, it was clear that the balance-sheet would show a loss to the town. He had no kind of confidence in the methods adopted, the intimidation aroused, and the thoroughly

un-English manner in which this affair had been rushed through, and attempts made to prevent councillors and ratepayers alike from getting to the bottom of it.

The Chairman of the Gas and Water Committee of the Corporation (Mr. J. Grose), after expressing regret that the only people on the platform were monopolists and men associated with the Gas Company, went on to say that in Falmouth all classes were convulsed, the monopolists were falling, and the death-rattle was heard in "the retorts of this abominable and atrocious water gas." They had not been told that the Gas Company were paying dividends of 13 per cent.

The next speaker urged that if the Corporation would only do their duty by insisting on the Water Company supplying filtered water, there would be no cause of complaint as to the supply. Then came a denial from Alderman Banks that he voted for Mr. Silverthorne's scheme. As a matter of fact, not a single member of the Corporation had voted for it, for the scheme had never been before that body. It was possible to show from Mr. Silverthorne's report itself that there could be no profit for the first ten years. If the promoters had put that before the town plainly, he would have voted for it; but as it was now placed before the ratepayers, he declined to support it.

A vote was then taken; the great majority being opposed to the purchase scheme.

At a meeting of the Town Council on Wednesday, Mr. Mackenzie said he had heard of voting-papers being collected and taken away in a man's pocket. The Town Clerk said he had received complaints from each side similar to that made by Mr. Mackenzie. Mr. Grose stated that a man had told him that he had collected 37 blank papers and taken them to the Gas Company's representatives, and had them filled up. Mr. Mackenzie said that in the case he had mentioned the circumstances were within his personal knowledge, and there could be no mistake. Mr. Grose said the man who collected the 37 papers was sent to him to know if he would buy them.

GAS-WORKERS' WAGES AT LEEDS.

The Gas Committee in Conference with the Men.

Many of our readers may remember that some two months since an application was made on behalf of all classes of men engaged in the Leeds Corporation Gas-Works for an advance of 4d. per day; and at the same time the workpeople in the pipe-laying and meter departments asked for an eight-hours day. In view, however, of the approaching end of the municipal year, the Gas Committee resolved to defer consideration of the request till after the elections, and promised to name a date for an interview with the officials of the Gas-Workers' Union and a deputation of the men. This conference took place last Wednesday at the Municipal Buildings; and the points were discussed on both sides, the "Yorkshire Post" reports, in a friendly spirit. It was pointed out in the application that certain sections of the men had not received any advance for over 20 years—for instance, the stokers. Although the latter had obtained a reduction of hours, they had, it was said, to work at a far greater pressure than with a twelve-hours working day. The application concluded by reminding the Committee that they had often expressed their desire to pay as much wages as other places doing similar work, and added the opinion that if they made comparisons they would agree that the men were asking nothing unreasonable.

The Chairman of the Gas Committee (Alderman Lowden) presided over the conference; and at the outset, the application for an eight-hours day on behalf of the men employed in the meter department was withdrawn. The Chairman explained that it was not so much the intention of the Committee to discuss the matter with the deputation as to listen to their application and the statements upon which it was based. Of course, they might think it necessary to ask questions with regard to statements put forward; but they would not come to any decision without further investigation. The deputation then stated their case. It was urged that their work deserved greater remuneration; and in the case of the stokers, it was mentioned that in Liverpool, Birmingham, Sheffield, Newcastle, and South Shields the rate of payment was better than in Leeds. Again, in other towns the firemen had more wages.

At the termination of the interview, the Chairman said the question the Committee would have to consider was not only the amount of wages paid elsewhere, but also the amount of work done for the wages. The Committee would thoroughly investigate the cases to which attention had been drawn, and would probably visit some of the places named. Referring to the statement in the application, that the Committee had expressed their desire to pay as much wages as other places doing similar work, Alderman Lowden said they were anxious, and even determined, that this should be the case. The investigations of the Committee would probably take some time; and if the time appeared long, the deputation must not look upon it as being wasted. It was, he pointed out, most desirable that the statements put before them should be investigated; and they would acquaint the deputation with the result of their decision at the earliest opportunity.

The deputation expressed their gratification at the courteous way in which they had been treated.

Afterwards, the Committee had an interview with men representing the pipe-laying department. They based their application for an alteration in wages and conditions on the ground that their work was uncertain, and had to be performed in all sorts of weather, and that they were often called upon to turn out at night. The Committee promised to duly consider the application.

The machine-men at the New Wortley Gas-Works, numbering between 20 and 30, also applied for an advance; and it was arranged that the Chairman should meet a deputation from the hands on Friday afternoon.

The Proposed Purchase of the Larne Gas-Works.—A memorial containing the signatures of 800 ratepayers of Larne has lately been forwarded to the Local Government Board for Ireland, asking them to withhold their consent to the purchase of the gas-works by the Town Commissioners, as it is considered unwise for an expiring Board to plunge their successors into such a scheme. The Local Government Board have submitted the memorial to the Commissioners for their views thereon.

ELECTRIC LIGHTING NOTES.

The Board of Trade have notified the Limerick Corporation that if the Provisional Order empowering the Local Authority to carry out an electric lighting scheme for the city is not put in force forthwith, the Order will be revoked. The Board have extended the time for the Order being put into force on several occasions; and the time last granted has lapsed long since.

Mr. W. A. Ducat, of the Local Government Board, held an inquiry at Whitehaven last Wednesday, with reference to an application by the Town Council for power to borrow £12,000 for purposes of electric lighting extensions. The Mayor (Mr. J. R. Musgrave) stated that additional plant was absolutely necessary to meet the great demand. There was no opposition.

Another interruption in the electric lighting took place at Tunbridge Wells last Thursday evening, owing to the failure of a fuse; and although the street lighting was not affected, the lights in the Town Hall, where a bazaar was in progress, the Technical Institute, where classes were being conducted, and the Swimming Baths, were out for about three-quarters of an hour, and oil-lamps had to be resorted to.

At the meeting of the Dublin Corporation yesterday week, Mr. Smyth moved the adoption of a report of the Electric Lighting Committee, which stated that the gross income for the year 1897 was £13,089; and the expenditure £8036. A surplus of £5052 had been carried to the net revenue account, out of which charges for interest and repayment of principal had been met; leaving a credit balance of £953 on account of the year. Mr. M'Carthy referred to the condition of darkness in which the city was left on the previous Saturday, and asked for information as to what had been done by a Committee of the Whole House appointed at his request. Alderman Meade was understood to say that the Committee would have to come before the Council for their sanction to an application for a loan of £8000 for the renewal of the mains. Pending this they had confined their efforts to getting the existing system into as good order as possible. The High Sheriff agreed that the citizens were labouring under a terrible inconvenience in consequence of what was required not being supplied. The report was adopted.

The shareholders of the Yorkshire House-to-House Electricity Company yesterday week ratified the provisional agreement entered into between the Directors and the Leeds Corporation for the transfer of the undertaking. It was pointed out by the Chairman (Mr. Grosvenor Talbot) that these final steps were not being taken through any want of faith, either on the part of the Directors or the shareholders, in the Company, but under the inexorable terms of the Act and Provisional Order which called the Company into existence. He gave an account of the negotiations between the Directors and the Corporation; and with reference to the grant of a Provisional Order to the Corporation to issue 5 per cent. irredeemable stock, he said that this was a departure from the position the Board of Trade took in their decision of the Sheffield case a short time before. The Leeds Corporation were perfectly right to endeavour to do the best they could for the ratepayers; but it was, he could not but think, a grave reflection on a great Government department that they should reverse the decision made a few months previously on outside pressure being applied. The provisional agreement was adopted. Under clause 2, the Auditor of the Company (Alderman Gordon) and the City Accountant (Mr. Darry) have made a further investigation of the Company's books, and have agreed that the amount of expenditure on capital account to be allowed for by the Corporation is rather more than £217,000. To this, various amounts representing book debts, stock, and other items must be added, the total, it is understood, being somewhere near £250,000. Special efforts are being made by the Chairman of the Parliamentary Committee of the Corporation (Mr. Wilson) and all concerned to complete the transfer early next month.

The question of whether Stretford should have an independent electric light station or accept (at a price) a supply of current from Manchester, led to an animated meeting of Stretford ratepayers last Wednesday. Mr. R. P. Wilson, who had been consulted by the Urban District Council upon the question of the proposed erection of a central generating station, recommended that the Council should not accept the offer of Manchester, but should provide their own supply of electricity. On the report being presented, Mr. W. Wardale moved a resolution to the effect that Stretford should accept the offer of the Manchester City Council to put down and maintain at their own risk the necessary plant, mains, &c., for providing electricity in Stretford, on the condition that the charge to consumers in Stretford be the same as to consumers in the city, and the Council to have the option of purchase on equitable terms at the expiration of twelve years. Adversely criticizing the report of Mr. Wilson, Mr. Wardale said he was at one time in favour of Stretford doing the work, but when he saw the offer Manchester had made he came to the conclusion that he was wrong, and had come round to the opinion he now held—that the Council should accept the offer made to them. Mr. T. Johnstone, the Chairman of the Electric Lighting Committee, combated many of the statements made by Mr. Wardale. He urged that Stretford was favourably situated for the erection and working of an electric plant for the supply of the residents, and that there was every prospect of a remunerative business being done. Manchester had done nothing for Stretford in the past; and it would not be to the benefit of Stretford (who were opposed to amalgamation with the city) to allow Manchester to obtain vested interests in the township. In the course of the subsequent discussion Mr. Marshall Stevens said he should vote for the resolution, because he was opposed to the Stretford Council putting down works themselves. At the same time he did not feel that the hands of the Council should be tied in any particular point; and if they found that electricity could be supplied on even better terms than those offered by Manchester, why should they not consider the proposal? In answer to questions, the legal adviser to the Council explained that if the meeting passed the resolution they tied the Council to the principle of going to Manchester on equitable terms to obtain their supply of electricity; while if they decided against the resolution, it meant practically that the matter was referred back. Upon a division being taken, the resolution was carried by a large majority, whereupon the Chairman demanded a poll of the ratepayers on the question.

The purchase of the Electric Supply Company's undertaking was advanced another stage at a special meeting of the Birmingham City Council last Tuesday when the promotion of the Bill which is to authorize

the transaction was agreed to. The Lord Mayor (Alderman Beale), in explaining the measure, stated that, in addition to the clauses dealing with the purchase, the General Purposes Committee recommended that the Council should take power to supply not only the areas occupied by the Company, but the whole of the city. For the capital of the present undertaking, they asked that they should be allowed 42 years for repayment; and they based their plea for this extended period on the consideration that they were having to pay heavily for goodwill. This, however, could not apply in respect to any expenditure for lighting parts of the city over which the Company had no powers. The Council had pledged themselves to pay the Company £420,000. When they commenced negotiations, the latter had increased their capital powers; but, at the request of the Council, they forebore to add to their actual capital, and obtained from their bankers the amount immediately necessary for their requirements on capital account. About £30,000 would represent what the Company would have actually spent in this way until the Corporation came into possession of the concern. There might be other payments; and the Committee had put into the Bill £500,000 as the sum required for the existing concern, and which they sought 42 years as the time for repayment. For any further loans raised by permission of the Local Government Board, they would have to be content with such period as the Board would allow in the ordinary way. The only objecting member was Mr. Lane, who said he did not vote for the agreement to purchase on the ground that he did not think the Council were given sufficient time to consider the subject. He regarded the premium the Company were to receive as far too much. The Council might have taken in hand the unappropriated districts, and have run parallel with the Company. A little gentle competition in this way would have kept down the price of the shares to something nearer their intrinsic value. Out of respect to the Council, he would not vote against the resolution; but, out of respect to his own conscience and the interests of his constituents, he felt he could not vote for it. The Lord Mayor, in reply, said he had never contended that the price to be paid for the undertaking was based upon the actual value of the concern taken by valuation. He simply put it that it could not be obtained for less; and while the Corporation were in the field as buyers, there was no likelihood of the shares falling in price. Since the bargain was made, he had had the returns of the business taken out for the ten months of the present year. The sales had gone up by 428,990 units—an increase of 54·8 per cent. on the corresponding period of last year. The money equivalent of this was £6567, or an increase of 35 per cent. on last year. Upon the basis of these figures, the concern was worth a good deal more than when the Corporation commenced their negotiations. He thought there was now every indication that the works would come into their hands as a self-supporting undertaking, and that in a short time it would be a remunerative one. As already indicated, the Bill was agreed to.

THE STOCKPORT WATER-WORKS PURCHASE QUESTION.

A Special Meeting of the Stockport Town Council was held last Wednesday, to pass resolutions authorizing the promotion of Bills in the ensuing session of Parliament enabling the Corporation (*inter alia*) to purchase the undertaking of the Stockport District Water-Works Company. Alderman W. Lees, in introducing the subject, said the nominal capital of the Company was £344,570, to which there must be added £9209 for capital account overdrawn—making £353,779 as the total capital. The loans of the Company, £69,000, would be taken over as they stood. They were repayable at short periods; and the rate of interest on them meanwhile averaged about 3 per cent. The holders of the 5 per cent. preference stock, which amounted to £20,952, would receive annuities yielding the same dividends as before. The holders of the 4½ per cent. preference stock, amounting to £20,095, would likewise receive annuities producing the same dividends as before. The holders of the consolidated or ordinary stock, which amounted to £187,522, would receive annuities of £8 for every £100 of stock they held; and the holders of new ordinary stock, amounting to £47,000, would receive annuities of £7 10s. All the annuities would be redeemable at 33⅓ years' purchase at the end of 60 years. Then the Corporation would also pay over in cash to the Company the sum of £25,641 9s. 4d., and a further sum in cash (representing the amount overdrawn at the bank at the time of transfer) in respect of the capital expended, but for which they had not created stock—making a total cash payment of £34,851. This would appear, he said, a high price for the undertaking; but having regard to the prices paid in recent years for other water-works, the gentlemen who had been conducting the negotiations on behalf of the Corporation felt that they were paying a sum which was both fair to the Company and to the ratepayers. Calculations made by the Borough Treasurer, showed that, provided 60 years were allowed for the redemption of the cost, and the sinking fund contributions were suspended for the first seven years, and only the same annual increase of income as during the past seven years was maintained, a rate of 1½d. in the pound for a few years would be ample to meet any deficiency and the sinking fund contributions. Alderman F. B. Robinson stated that twelve years ago the Corporation could have purchased the works for £200,000 less than they would have to pay now. He believed the calculations mentioned by Alderman Lees were on the safe side—that the result of the purchase would be to ensure a better and more adequate supply of water for the town and district, and that the bargain effected would be a fair one for the Company and of lasting benefit for the people in the districts concerned. After some discussion on points of detail, the resolutions were adopted.

Wallingford and Its Gas-Works.—In the "JOURNAL" for Aug. 30, it was reported that the Directors of the Wallingford Gas Company had rejected an offer from the Town Council to purchase the gas-works for £7500. Negotiations have since taken place on the subject; and at the meeting of the Council on the 16th inst., the seal was affixed to an agreement for the purchase and carrying on of the gas undertaking at the price of £7500 (which had been fixed by an expert valuer) and £60 for the fixed meters. Application to the Local Government Board for a Provisional Order to acquire and work the property will be made in due course.

METROPOLITAN WATER SUPPLY COMMISSION.

Thirty-sixth Day—Tuesday, Nov. 22.

(*Viscount* LLANDAFF, *Chairman*, *Sir* JOHN E. DORINGTON, Bart., M.P., *Sir* G. B. BRUCE, M.Inst.C.E., *Major-General* A. DE COURCY SCOTT, R.E., *Rt. Hon.* J. W. MELLOR, Q.C., M.P., *Mr.* A. DE BOCK PORTER, C.B., *and Mr.* R. LEWIS.)

The Commission sat at the Guildhall, Westminster.

The following are the Counsel engaged: Mr. POPE, Q.C., and Mr. CLAUDE BAGGALLAY, Q.C., for the New River and the Southwark and Vauxhall Companies; Mr. LITTLER, Q.C., and Mr. LEWIS COWARD for the Kent Water Company; Mr. PEMBER, Q.C., for the Lambeth, East London, Grand Junction, and West Middlesex Water Companies; Mr. RICKARDS for the Chelsea Water Company; Lord ROBERT CECIL for the Hertfordshire County Council; Sir JOSEPH LEESE, Q.C., M.P., for the Kent County Council and Kent Local Authorities; Mr. BALFOUR BROWNE, Q.C., and Mr. FREEMAN, Q.C., for the London County Council; Sir R. NICHOLSON for the Middlesex County Council; and Mr. GABRIEL P. GOLDNEY (Remembrancer) for the Corporation of the City of London.

Mr. POPE, in reply to the CHAIRMAN, said scheme No. 1 of intercommunication, to which reference had been made at the last few sittings, had no regard to a surplus from the Southwark and Vauxhall Company. Scheme No. 2 contemplated no supply coming directly from the Chelsea Company, though it had relation to this Company as a supplementary means of increasing the intercommunication.

Mr. FREEMAN pointed out that in scheme No. 1 there were three cases where the Southwark and Vauxhall Company were connected with other Companies—the Lambeth, Kent, and East London.

Mr. POPE said it was useless to connect, if there was no water to pass.

Mr. FREEMAN replied that they would hardly make the connection unless there was water to pass.

Mr. *R. E. Middleton*, Joint Engineer with Mr. Walter Hunter for the Staines reservoirs scheme, who was under examination when the Commission adjourned in July last, was re-called and further examined by the CHAIRMAN. He said the effect of purchase of the undertakings would be loss to the consumers and still more to the ratepayers, if the condition as to revenue spoken of by a witness for the London County Council were carried out—viz., if the rates were reduced to one level (that of the West Middlesex Company) for all London. Several other things also, the cost of which the Companies had to bear at present, would fall upon the ratepayers—the damage caused by severe frost, for instance. Purchase, though no doubt it would prove remunerative in the future, would not be so at once. The liability to frost or drought was not an element which would be considered in fixing the price a public authority were to pay for the purchase of the concerns, because it was one to which the purchasing body would be just as much liable as the Companies. If a frost or drought occurred during the years the income of which was being taken as a basis, they would be considered; not otherwise. The average past effect of frost or accident would affect the price; but anything unforeseen or abnormal would not. Undoubtedly differential rates were fairer for such a place as London, where there were high-lying and low-lying districts, and where, therefore, the cost of pumping to the high parts was greater than to the lower ones. Even in the case of the Lambeth and an adjoining Company, though both drew their water from the Thames, the length of the Lambeth mains was greater, and the cost of the pumping more, than they were with the other Company; and it was fair therefore that the charge should be higher in the case of the former Company. He could not prove, but he had a strong impression, that for two houses, equally good, the landlord would get less for one in the Lambeth district, where the water rate was high, than for one in the Southwark and Vauxhall Company's area, where the rate was lower. Saving in maintenance and management was not likely to follow purchase. Municipal management did not as a rule effect economy. A Board who had existed for years, and were paid to do their duty, were much more likely to be economical than one of a fleeting character, and who were unpaid.

The CHAIRMAN: That observation would not apply to purchase by a Special Board of experts created *ad hoc*?

Witness: No; it would not.

In answer to further questions, witness said that a purchasing authority would contemplate employing fewer officials; but he did not believe, if the whole concerns were in one hand, there would be a saving in management. Probably there would have to be a larger staff than now. With regard to the collection of rates, if there were a municipal body already collecting other rates, saving might result by transferring the duty to this body. If purchase did occur, the price would have to be fixed by arbitration under the Lands Clauses Act; this having been the regular custom, and there being, so far as he knew, precedent for purchase in no other manner except by agreement. He saw no reason in the present case to depart from the custom. He certainly thought the shareholders were entitled to prospective value, if there were any; and, on the other hand, if there were prospective diminution of income, the purchaser would be entitled to the benefit of that. There was no prospect of increase in the Companies' income in respect of the 130 million gallons they were at present supplying, except perhaps that arising from the quinquennial valuation. There were, however, a number of items tending to decrease, rather than increase, the benefit of quinquennial valuations—the fact that the larger charges were made on railways and great business undertakings, and on the Water Companies themselves. The big undertakings were supplied by meter, so that the increase of their rateable value did not mean an addition to the Company's income. The eight Companies in 1871 paid together in rates £70,423; and in 1896, £235,630. In his calculations he had not considered the matter of the sinking fund in relation to the purchasing authority, nor of the sinking-fund clause in relation to the Companies.

Mr. DE BOCK PORTER said it would be impossible to overlook in any arbitration the fact that the sinking-fund clauses would make an enormous charge in the future.

Mr. PEMBER replied that it would only be enormous on the supposition that purchase was indefinitely postponed. But the sinking-fund clauses were based on the fact that purchase should not be postponed.

Further examined by the CHAIRMAN: Future expenditure upon storage reservoirs for the existing supply would be a cause for reduction of the purchase price, so far as it had not been already added in the account. On the other hand, the Companies' incomes would have to be regarded as progressive, because of the increase in valuation occurring from time to time in London, and of the increase of supply. Witness held there was no necessity for going to Wales for further water; but, if there was, the outlay would be a deduction from the cost of purchase. Under present conditions, the Companies having an adequate supply, the cost of going to Wales would fall upon the purchaser, in addition to the purchase money. Supposing the eight Companies were purchased by the London County Council, he did not think it would be convenient for them to supply the outlying counties in bulk. It would be an exceedingly expensive arrangement, necessitating a large amount of alteration to the present mains. The mains of the Companies had not been laid with the idea of supplying in bulk outside the given area; and they crossed the boundaries of the County of London in all directions. In many cases, the centres of supply were outside the County Council boundary when they supplied inside, and inside when they supplied outside. If the supply were to be given in bulk from the inside outwards, many mains would have to be relaid, and meters placed on all of them. In the East London district, there were 11 mains crossing the county boundary. The water travelled from outside to inside the County of London; and if the outside were to be supplied, it would have to be carried outside again. Most of the East London service reservoirs, pumping-stations, and filter-beds, were outside; and if the County Council were to supply Essex in bulk, they would have to bring the whole of their filtered water from outside inside, and then out again. Essex could do very well with the existing works; but London would need fresh service reservoirs. The matter would be exceedingly complicated and no engineer would arrange it in this way if he could avoid it. In the case of the New River Company, the main crossed and re-crossed the boundary between the County of London and the Outside Authority 38 times, besides which there were a large number of smaller service-pipes in cross-streets. The whole of these would have to be metered, unless they were drawn together in one, and the supply given to the Outside Authority at one point. There were several miles of boundary; and to give the supply in one, they would have to lay one main down the boundary on one side, and another down the boundary on the other, connecting all the 38. This would involve considerable expense, and be very complicated. In two cases—Hornsey Lane and Stroud Green Road—there were three mains in the same street. The boundary in each instance was in the centre of the road, and it would be therefore impossible to say to which Authority the mains would belong—especially if the boundary fell on (say) the middle pipe. The pumping-stations of the Company were entirely outside, but about half the service reservoirs were inside and half outside. The difficulty of making the reservoirs outside distribute the water supplied in bulk from the London County Council, lay in the fact that some of those inside supplied outside, and *vice versâ*. The thing was not impracticable, but would be very expensive. It would cause a remodelling of the whole system. Witness went on to detail difficulties of a similar character in connection with the other Companies. In the West Middlesex district, there were 20 main pipes crossing the boundary, besides 61 smaller service-mains, about half of which supplied streets inside, and half outside, the boundary. In the Grand Junction area, the boundary was crossed by four trunk mains delivering from inwards. The pumping-stations at Hampton and Kew, and the service reservoirs at Hanger Hill, containing 53 million gallons, were outside the county; while the Campden Hill service reservoirs, containing 18 million gallons, were within. As to the Chelsea Company, their works were almost entirely outside, while the supply was wholly inside, the County of London. This meant that, in order to make the Chelsea Company supply Surrey in bulk, new mains would have to be laid. There were no means at all now, except the mains to London, of supplying Surrey. South of the Thames there were three Companies—the Southwark and Vauxhall, the Lambeth, and the Kent—and their sources were chiefly outside the County of London. The service reservoirs of the Southwark Company were within the county, at Nunhead and Forest Hill; so that the difficulty arising in the other cases would not occur here to the same extent. There were no mains by which water could be supplied in bulk from these reservoirs to Surrey; the mains at present in existence in Surrey were used as supply mains both inside and outside. They would have to be cut off and reconnected to make them useful as supply mains for Surrey. The Lambeth Company's water was brought into London by three large mains from the works at Ditton to Brixton, crossing the county boundary at Merton. They had service reservoirs within and outside the county; and those outside supplied both inside and outside. Here, to enable a supply in bulk to be given outside, the system would have to be largely remodelled. The main supplying inside could be continued for its present use; but for the outside supply a new main would be required. The Kent Company derived their supply entirely from wells. The largest pumping-station was at Deptford; others being at Plumstead, Shortlands, Crayford, Farnborough, and Wilmington. Plumstead and Deptford were within the County of London, and all the others outside. Service reservoirs of 10,525,000 gallons were within, and others of 3,098,000 gallons were outside the County of London. In this case, the supply in bulk would be more easy. Witness had not estimated the cost of relaying these different systems, so as to enable the County of London, if it were the purchaser of the whole, to supply outside in bulk. It would mean an enormous amount of investigation, which he was not in a position to undertake. Roughly speaking, he said it would be going on for a million—certainly hundreds of thousands of pounds.

By Major-General SCOTT: He was not intimately acquainted with the system of supplying in bulk in some of the northern towns. The only difference between such towns and London, he thought, was that the London systems had not been laid out in view of the future supply to a population beyond an arbitrary line, like the county boundary; while most of the northern towns had been more or less modelled so as to supply directly outside through one, or at any rate only a few, mains.

By the CHAIRMAN: The expense of putting meters on the mains was not formidable, but when all these meters were fixed, it would be necessary

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 1213.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 13	10½	Alliance & Dublin 10 p. c.	20½—21½	..	4 17 8
100,000	10	,,	7½	Do. 7 p. c.	16—17	..	4 8 3
800,000	100	July 1	5	Australian 5 p. c. Db.	105—107	..	4 13 6
200,000	5	Nov. 11	6	Bombay, Ltd.	6¼—6⅜*	..	4 2 11
40,000	5	,,	6	Do. New, £4 paid	4¼—4⅜*	..	5 1 1
830,000	Stk.	Aug. 12	12	Brentford Consolidated	275—280	..	4 5 9
240,000	,,	,,	9	Do. New	210—215	..	4 3 9
50,000	,,	,,	5	Do. 5 p. c. Prf.	140—145	..	3 9 0
159,375	,,	June 10	4	Do. 4 p. c. Db. Stk.	130—135	..	2 19 3
220,000	Stk.	Sept. 15	11½	Brighton & Hove, Orig.	263—268	..	4 5 10
226,320	,,	,,	8½	Do. A. Ord. Stk.	190—195	..	4 7 2
933,500	Stk.	Aug. 31	5	Bristol, 5 p. c. max.	125—130	..	3 16 11
420,000	20	Sept. 29	10	British	49—50	..	4 0 0
50,000	10	Aug. 12	11½	Bromley, Ord. 10 p. c.	25—27	..	4 5 2
75,000	10	,,	8½	Do. 7 p. c.	20—22	..	3 17 3
500,000	10	Oct. 13	6	Buenos Ayres (New) Ltd	9¼—10	..	6 0 0
98,122	Stk.	June 29	4	Do. 4 p. c. Db. Stk.	98—100	..	4 0 0
150,000	20	July 14	8½	Cagliari, Ltd.	29—30	..	5 10 0
100,000	10	Sept. 29	7	Cape Town & Dis., Ltd.	14—15	..	4 13 4
50,000	50	Nov. 2	6	Do. 6 p. c. 1st Mort.	57—59	..	5 1 8
550,000	Stk.	Oct 13	13½	Commercial Old Stock	310—320	..	4 4 5
200,750	,,	,,	10½	Do. New do.	247—252	..	4 3 4
200,750	,,	June 10	4½	Do. 4½ p. c. Db. dc.	147—152	−1	2 19 3
800,000	Stk.	June 10	10†	Continental Union, Ltd.	205—210	..	4 15 3
200,000	,,	,,	7†	Do. 7 p. c. Prf.	190—195	..	3 11 10
51,600	Stk	Aug. 31	14	Croydon A 10 p. c.	305—310	..	4 10 4
168,400	,,	,,	11	Do. B 7 p. c.	255—265	..	4 3 0
555,000	Stk.	Aug. 12	5½	Crystal Palace Ord. 5 p. c.	125—130	..	4 0 9
60,000	,,	,,	5	Do. 5 p. c. Prf.	140—145	..	3 9 0
486,090	10	July 28	11	European, Ltd.	28—24	..	4 11 8
354,060	10	,,	11	Do. £7 10s. paid	17—18	..	4 11 9
5,922,230	Stk.	Aug. 12	12½	Gaslight & Coke, A, Ord	282—287	−4	4 5 4
100,000	,,	,,	4	Do. B, 4 p. c. max.	120—125	..	3 4 0
665,000	,,	,,	10	Do. C, D, E, 10 p. c. Prf.	308—313	..	3 3 11
80,000	,,	,,	5	Do. F, 5 p. c. Prf.	152—157	..	3 3 8
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	233—238	..	3 3 0
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	195—200	..	3 10 0
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	308—313	..	3 3 11
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	185—190	..	3 3 2
1,061,150	,,	June 10	4	Do. 4 p. c. Db. Stk.	131—133	..	3 0 2
294,850	,,	,,	4½	Do. 4½ p. c. do.	148—153	..	2 18 10
958,000	,,	,,	6	Do. 6 p. c. do.	195—200	..	3 0 0
70,000	10	Nov. 11	8	Hongkong & China, Ltd.	13—14*	..	5 14 4
3,800,000	Stk.	,,	10	Imperial Continental	220—225*	+3	4 8 11
376,400	100	Aug. 2	4	Do. 4 p. c. Dbs. Red.	98—101	..	3 19 3
473,600	Stk.	Aug. 12	3½	Do. 3½ p. c. Db. Stk.	102—105	..	3 6 8
560,000	100	Oct. 1	5	Met. of Melbourne	5 p. c. Db. 110—112	..	4 9 3
250,000	100	,,	4½		4½ p. c. Db. 105—107	..	4 4 1
					Exdiv.		

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
75,000	5	June 29	6	Malta & Medn., Ltd.	4⅜—5½	..	5 14 3
541,920	20	Nov. 11	5	Monte Video, Ltd.	13—14*	..	7 2 10
617,946	Stk.	Aug. 31	9¾	Newc'tle & Gatesh'd Con.	230—240	..	4 1 3
252,355	Stk.	Jan. 8	3½	Do. 3½ p. c. Db. Stk.	113—117	..	2 19 10
150,000	5	May 26	8	Oriental, Ltd.	7⅛—7½	..	5 3 3
135,000	5	,,	8	Do. New, £4 10s. pd.	6¼—7	..	5 2 11
15,000	5	,,	8	Do. do. 1879, £1 pd.	1⅝—1⅞	..	4 11 5
60,000	5	Sept. 29	7	Ottoman, Ltd.	5—5½	..	6 6 2
500,000	100	June 1	6	People's Gas of Chicago 2nd M. Bd.	103—108	..	5 11 1
848,070	10	Oct. 13	6	River Plate Ord.	9¼—9⅜	..	6 3 1
250,000	Stk.	June 29	4	Do. 4 p. c. Db. Stk.	99—101	..	3 19 3
250,000	10	Sept. 29	10	San Paulo, Ltd.	14½—15½	..	6 9 0
135,000	Stk.	Sept. 15	10	Sheffield A.	242—245	..	4 1 8
209,053	,,	,,	10	Do. B.	242—245	..	4 1 8
447,427	,,	,,	10	Do. C.	242—245	..	4 1 8
5,600,000	Stk.	Aug. 12	5⅓	South Metrop., 4 p. c. Ord.	138—142	..	3 15 1
1,460,000	,,	July 14	3	Do. 3 p. c. Db. Stk.	102—105	..	2 17 2
60,000	Stk.	Aug. 31	12	Tottenham and Edmonton A.	280—290	..	4 2 9
60,000	,,	,,	9	Edmonton B.	200—210	..	4 5 9
182,380	10	June 10	7	Tuscan, Ltd.	10¾—11½	..	6 1 9
149,900	10	July 1	5	Do. 5 p. c. Dbs. Red.	100—103	..	4 17 1
				WATER COMPANIES.			
746,164	Stk.	June 29	10½	Chelsea, Ord.	313—318	..	3 6 0
150,000	,,	,,	5	Do. 5 p. c. Prf.	170—175	..	2 17 2
160,000	,,	,,	4½	Do. 4½ p. c. Pf. Stk., 1875	148—152	..	2 19 3
175,785	,,	Sept. 29	4½	Do. 4½ p. c. Db. Stk.	155—160	..	2 16 3
1,720,560	Stk.	Oct. 18	7	East London, Ord.	212—217	..	3 4 6
654,740	,,	June 29	4½	Do. 4½ p. c. Db. Stk.	158—162	+1½	2 15 7
390,000	,,	,,	3	Do. 3 p. c. Db. Stk.	103—105	..	2 17 2
700,000	50	June 29	7½	G'd Junct'n, 10 p. c. max.	115—118	..	3 3 7
310,000	Stk.	Sept. 29	4	Do. 4 p. c. Db. Stk.	138—143	..	2 15 11
708,000	Stk.	Aug. 12	14	Kent	365—370	..	3 15 8
160,000	,,	,,	7	Do. New, 7 p. c. max.	212—217	..	3 4 6
1,043,800	100	June 29	10½†	Lambeth, 10 p. c. max.	300—305	..	3 8 10
406,200	100	,,	7½	Do. 7½ p. c. max.	230—235	+2	3 9 10
350,000	Stk.	Sept. 29	4	Do. 4 p. c. Db. Stk.	138—143	..	2 15 11
500,000	100	Aug. 12	18¼	New River, New Shares	432—457	..	3 0 8
1,000,000	Stk.	July 28	4	Do. 4 p. c. Db. Stk.	138—143	..	2 15 11
902,300	Stk.	June 29	6	Southw'k & V'xhall, Ord.	167—172	+2	3 9 9
126,500	100	,,	6	Do. do. 7½ p. c. max.	160—165	..	3 12 9
489,200	Stk.	,,	5	Do. do. 5 p. c. Prf.	170—173	..	2 17 10
1,019,585	,,	Oct. 13	4	Do. 4 p. c. A Db. Stk.	138—143	..	2 15 11
1,155,066	Stk.	June 10	10	West Middlesex	295—300	..	3 6 8
200,000	,,	,,	4½	Do. 4½ p. c. Db. Stk.	162—165	..	2 14 7
200,000	,,	Sept. 15	3	Do. 3 p. c. Db. Stk.	102—105	..	2 17 2
					Ex div.		

† Next dividend will be at this rate.

to enlarge the mains. Meters meant an obstruction, and had to be watched. They increased the liability to error; and no engineer liked to have many on his system. There was another plan which had been discussed—viz., the severing not only of the system of distribution, but of the sources of supply between London and the outside counties. He had considered this question as regards the severance between the County of London and Surrey. He understood the proposal to be that Surrey should receive from London their present supply, *plus* 20 per cent.—a total of 8 million gallons a day—and that they were to look for no more water from the same source. This seemed to him to make the whole idea impracticable, because the source of supply was in Surrey, and either Surrey should have the means of supplying itself, or should expect to get its whole supply from London, and not be limited to 8 million gallons daily. The idea apparently was to hand over to Surrey part of the subsiding reservoir capacity of the Lambeth Company, with pumping power sufficient to fill these reservoirs from the Thames. The reservoirs, two in number, had a combined capacity of 125 million gallons, and there were four engines of 190-horse power collectively for pumping into them. There were also two trunk mains leading from the subsiding reservoirs at Molesey to Seething Wells—one a 54-inch brick culvert, and the other a 36-inch cast-iron pipe. It was proposed to hand over to Surrey part of the pumping machinery and a portion of the mains. The two reservoirs at Molesey had a wall between them, and could perhaps be divided; but it would be difficult. It would be more difficult to separate the engines, which were in the same house, and hand over one set to Surrey and keep the others; and still more difficult to separate the boiler power. Either the main or the culvert would have to be given to Surrey, so that each county would then only have one main and no stand-by. Practically this would involve, therefore, the laying of two new mains as stand-bys. The division of the filters would be even harder than the division of the reservoirs, besides which they would have the two sets of workmen side by side, who might not agree. The filters, which were merely separated by a wall along which the men walked, could not be fenced off from one another. Witness went on to describe in detail the means which would be adopted to distribute the water; showing how Surrey would have to pump the water allotted it by London from Seething Wells into London, and then out again, and, under present circumstances, giving supplies on the way to London, unless a fresh main were laid for the purpose. In the result, the Surrey County Council, to get their 8 million gallons, would have to purchase one of the subsiding reservoirs at Molesey; engines at five different stations with an aggregate horse-power of 653, although the total they required would be about 250; subsiding reservoirs at three stations with an aggregate capacity of about 100 million gallons; filter-beds at two stations with an area of about 8 acres, though about 6 acres would be sufficient; and service reservoirs at four stations with an aggregate capacity of 14½ million gallons, or 2½ million gallons more than their needs. They would necessarily have to come into London for two service reservoirs, and they would have to purchase mains very much larger than they required—33½ miles of main outside London, and 18 miles inside. The miles of main in the County of London would have to be duplicated by somebody in almost every case. Witness considered the scheme he had just detailed as very roundabout; and he should have thought it would have been preferable to have purchased out and out an intake at Molesey, and laid another main. He was opposed to any scheme of severance. It would in any event increase the cost of management and maintenance, and consequently the cost of the water; and would cause complications with the independent Suburban Companies regarding the division of further available supplies. He disapproved of counties being Water Authorities; a Watershed Authority was much more to the point than a County Authority. All the districts in the same watershed should be amalgamated into one supply.

The CHAIRMAN: If there is severance, you could never get help from one county to another, could you?

Witness: No.

Mr. BALFOUR BROWNE pointed out that under the Public Health Act the Local Authorities had a right to supply their neighbours in bulk, if they liked.

Witness (continuing) said the idea with regard to the proposal to sever Middlesex and London was that the authorized works of the New River Company at Kempton Park, including two subsiding reservoirs to contain 219 million gallons, 12 filter-beds for a daily supply of 11½ million gallons or more, pumping machinery and a main to supply at least the same quantity of water to a service reservoir 110 feet higher at Cricklewood, and another reservoir at Fortis Green 260 feet above the Kempton Park works, should be used for Middlesex. These works were to be supplied from the Staines reservoirs by the large aqueduct now in course of construction, which would be the property of the London County Council. Thus Middlesex would have to take its water in bulk from London; there being no intake at present that could be handed over to them. To give Middlesex means of getting water direct from the Thames, would entail the abandonment of other mains and supplies, at present in full use, and waste of pumping and distributing power. The scheme of going to Wales, to which witness was entirely opposed, was another incident which might be regarded as connected with a possible scheme of purchase. The Companies' mains were not adapted to receive a supply from outside, except in the same manner as at present. Water derived from Wales could not serve the whole of London by gravitation. Only about 89 per cent. of the capacity of the existing service reservoirs north of the Thames could be supplied from Elstree by gravitation. The mains of the Companies radiated from pumping-stations and had a tendency to be broken up into smaller ones, with varying pressures at different levels. These mains, therefore, were ill adapted to receive a supply from outside inwards. To connect the Welsh supply with these mains would be very difficult. The mains from Elstree would thus have to be connected with the service reservoirs of the Companies. If the Welsh water were only to be used to supplement the Thames supply, there would be no abandoning of pumping or filtering area in connection with the London Companies. He believed the Thames basin was capable of yielding more than 300 million gallons daily; and an instalment, beyond the present authorized draft of 185½ million gallons, of 214½ million gallons (making 400 million gallons), would cost less than the Welsh water. The capital cost of applying the Staines reservoirs condition

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fully to the 185½ million gallons (under the circumstances of 1893), would be £1,311,900. This figure included the cost of reservoirs, aqueducts, and other works, but not pumping. The capacity of the reservoirs this would involve would be 4373 million gallons, beyond the existing capacity of 866 million gallons—a total of 5239 million gallons. The cost he put at £300 per million gallons, which was based on actual contracts, but this figure of £300 would decrease in future. It included nothing for the New River conduit from Kempton Park, the expense of which was part of the cost of distributing. Witness put in a table (intended to compare with a similar one put in by Sir A. Binnie) showing the cost of supplying 185½ million gallons daily from the Thames. The total storage required he put at 5239 million gallons—allowing nothing for cleansing, and 476 million gallons for bottom water and evaporation. As 866 million gallons storage already existed, 4373 million gallons would have to be provided, which, at £300 per million gallons, would equal £1,311,900. To pump into the reservoirs 4431 million gallons (average for sixteen years), at 7s. 6d. per million gallons, equalled £1661 12s., which for sixteen years came to £26,586. The cost of pumping to supply a quantity increasing from *nil* to 55½ million gallons per day during sixteen years, at £2 4s. per million gallons, equalled £320,178. These three figures, *plus* £181,980 for pumping machinery for distribution, made a total of £1,840,644. If the pumping charges were capitalized at 30 years' purchase, a sum of £307,524 should be added—increasing the total to £2,148,168. This had been done by Sir A. Binnie; but witness did not concur. This figure compared with £4,705,185, the amount of Sir A. Binnie's estimate. The above "average for sixteen years" referred to the sixteen years' experience derived from Thames gaugings.

The Commission adjourned.

The thirty-seventh sitting of the Commission was held yesterday, at the Guildhall, Westminster—Viscount Llandaff presiding. Mr. Reginald E. Middleton, who was under examination when the Commission adjourned at the previous sitting, was further questioned with regard to his estimates for procuring additional supplies of water from the Thames.

THE DERWENT WATER SCHEME OF THE LEICESTER CORPORATION.

A Special Meeting of the Leicester Town Council was held last Tuesday—the MAYOR (Alderman Clifton) presiding—to consider the recommendation of the Water Committee that the Council should promote a Bill in Parliament to obtain a water supply from the Derwent Valley.

Alderman WOOD, in proposing the adoption of the recommendation, showed the necessity for procuring an additional supply of water for the borough. He then proceeded to refer to the satisfactory character of the reports the Committee had received regarding the Derwent water; and, alluding to the competing schemes, he expressed the belief that before the proposed Bill left the Parliamentary Committee room, an arrangement would have been arrived at with Derby. After describing the works designed by their Engineer (Mr. J. B. Everard), Alderman Wood said it was estimated that the cost of conveying 12 million gallons of water to Leicester, including the new reservoir and filter-beds in the Derwent Valley, would be £1,520,000. This sum included everything that would have to be provided for, with the exception of the workmen's dwellings. That it was a reasonable estimate, he thought the testimony of Mr. G. F. Deacon and Mr. R. E. Middleton showed; and he knew as a matter of fact that they were both of opinion that Mr. Everard had made a most liberal allowance, and that he would have been justified in stating a smaller sum. They proposed to take powers to fund the profits of the water undertaking from next year until the completion of the first section of the works. The net profit from the water undertaking for this year was a little over £7000; and it was estimated that by the year 1909 they would have accumulated in profits £178,515. It was intended to make up any deficiency that might occur on interest and sinking fund charges beyond the profit they acquired from the water undertaking in any one year. This fund would prevent them coming upon the rates till 1922; and they would have water to dispose of. Derby, no doubt, would come into this scheme. If Derby and Leicester did not work together in this matter, they could depend upon it that there would be a condition imposed upon them that they should give Derby water. If that condition existed, they would be paid for the water, and would derive a revenue from Derby and Derbyshire of no less than £14,846 a year. But the Committee were not relying on this, and had made their calculations to provide for the burden if they should have to bear it all themselves. In that case they would not have to come on the rates till 1922, and then only for a sum of about £30,000, which, it was estimated, a 5d. rate would produce. They felt that, as far as the rates were concerned, it was not a matter they need take seriously into account.

The speakers who followed were harmonious in supporting the scheme; and, on the vote being taken, every member voted in favour, except Mr. Billings, who remained neutral.

The statutory meeting of owners and ratepayers to consider the Bill was held on Friday; and consent was given to its promotion by a virtually unanimous vote.

Exhibition of the Kitson Gas-Light at Ripon.—According to the "Leeds Mercury," a special meeting of the members of the Ripon Corporation was called by the Mayor for last Wednesday evening to inspect the Kitson Gas-Light, which was shown for the first time in this country by the inventor, Mr. Arthur Kitson, of Philadelphia, son of Mr. Kitson, of Ripon. The basis of his discovery is lighting and heating with kerosene oil, by which it is claimed "the most brilliant artificial light ever produced can be obtained." The cost is said to be one-third that of incandescent lighting, and half that of ordinary gas. Mr. Kitson's process was described in the "JOURNAL" early in 1894 (Vol. LXIII., p. 110). The light is promoted in America by the Kitson Hydrocarbon Heating and Incandescent Company.

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NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

An interesting event of this week has been the opening of new gas-works at Carluke, of which I send a full account.* In commenting thereon, I may ask: What is the explanation of the exceptional prosperity of the Carluke Company? In all probability it is that the Company's business has been in good hands. That is almost apparent in the remark of the Chairman, that, with a few short intervals, his father and he have been Directors of the Company for the past forty years. A rolling stone gathers no moss. A company which is given to making changes in its directors or officials, is in the rolling position; and the truism may be applied to them. In this respect corporations are in a worse position than companies, because they, of necessity, make more frequent changes of their committee men than companies do of their directors. It is doubtless this matter of length of service, coupled with the greater facility for the selection of the best men, which accounts for the circumstance that companies are able to pay dividends and to hold their own, as regards price, with corporations.

Almost following up this train of thought, I come to the announcement that Mr. P. B. Watson, the Manager of the Falkirk Corporation Gas-Works, has resigned his post. Mr. Watson was Manager to the Falkirk Joint-Stock Gas Company, and was continued in office when the Corporation took over the Company four years ago. He has since effected great improvements and extensions of the works. The Peebles oil-gas process and Hislop's regenerative settings have been introduced into the works; and a new gasholder has been erected on Pease's wire-rope guiding principle. With all these heavy outlays, the price of gas has been reduced from 4s. 1d. to 3s. 9d. per 1000 cubic feet. The consumption has, at the same time, risen from 68 to 88 million cubic feet. A year ago a change was made in the convenership of the Works Committee, Mr. Cook Rennie succeeding Bailie Hamilton. About this time, the Corporation and the community of Falkirk were sharply divided over a scheme of burgh improvements, which was defeated; and I observe that ex-Bailie Hamilton has been rather severely treated since. Latterly it has been apparent that there was disagreement between Mr. Watson and his Committee. The Committee recently suspended him from his duties; and on Monday night it was reported that in Committee the motion was made that notice be given him that the Commissioners did not intend to continue him as Manager. No reason was stated for this proposed action; but it seemed to be indicated by Provost Weir, who was averse to the motion, and who, in moving that Mr. Watson be allowed another trial, said that if he were found to be neglectful of his duties, the clause in his agreement could be then put in force. When the Committee's minute came before the Commissioners on Monday, the Clerk intimated that he had that afternoon received a letter from Mr. Watson tendering his resignation, as from Jan. 9 next. Mr. Cook Rennie, in speaking to the minutes of the Committee, mentioned that there was a loss of £400 upon the past year's working, and there had been a slight loss also upon the past quarter. Of course, the resignation was accepted, and power was given to the Committee to make the best arrangement they could with Mr. Watson, which looks as if the Corporation have no desire to be altogether ungenerous to him. The hopelessly divided condition which the Corporation are in is, however, shown by the fact that when power was asked to advertise for a Gas Manager, one of the members said he had heard that a man had already been fixed upon. The statement was not denied, but was put aside with the remark that it was premature, and that the name might have been given.

The Commissioners had then before them a proposal by the Finance Committee to insure their workmen against liability for accident, with the General Accident Assurance Corporation, Limited, at a rate of 9s. per cent. upon the wages paid. As to this, the Commissioners surely showed great incapacity for conducting public work. The question was raised whether they should insure the Manager among the workpeople, or whether he could have a claim under the Workmen's Compensation Act. After a discussion, it was agreed that the Clerk should look into the matter, and see if it were necessary to insure the Manager. One gentleman thought that they paid the Manager a large salary, and if he did not come under the Act they should not insure him. I wonder how the Commissioners did not recollect that their own proposal was to insure all their employees—of whom the Manager certainly is one—against liability at common law, as well as under the two statutes; and that the Manager, if hurt, might have a claim at common law. To insure him at 9s. per £100 is a rate so reasonable that, if the Insurance Company were willing to accept it, the Commissioners should have had no hesitation in closing with them.

Another view of the cause which led to the partial failure of the electric light in Edinburgh is given by a firm who this week wrote—again to the "Glasgow Herald"—that the reason lay in the determination of the Corporation to refuse to take foreign-made plant. According to the writers, Continental firms can guarantee better delivery, and better made goods. I am not prepared to admit the latter statement. I have no doubt that the Electric Lighting Committee knew what they were doing when they formed the resolution they did. I observe that they are determined not to be caught napping another year, for they have given orders for £60,000 worth of plant, to be delivered, under penalties, by certain dates, for their new works in M'Donald Road. When it is in operation, the Committee will be able to supply more than double the current they can at present.

The operations of the road-roller in Arbroath have led to three claims for compensation being made against the Gas Corporation. Two of these are by the proprietor and tenant of the house in Glover Street, in which a gas explosion occurred; and the third is by a lady who was rendered unconscious, but recovered, by an escape of gas into her house, in the same thoroughfare.

The Rosewell Gas Coal Company, of Edinburgh, whose collieries are in Fifeshire, have applied to the Court of Session for authority to reduce their capital from £40,000 to £22,500, by writing off £7 from each of 2500 ordinary shares of £10 each. This step has been rendered necessary by the exhaustion of one of their gas-coal fields.

* This will be found on p. 1240.

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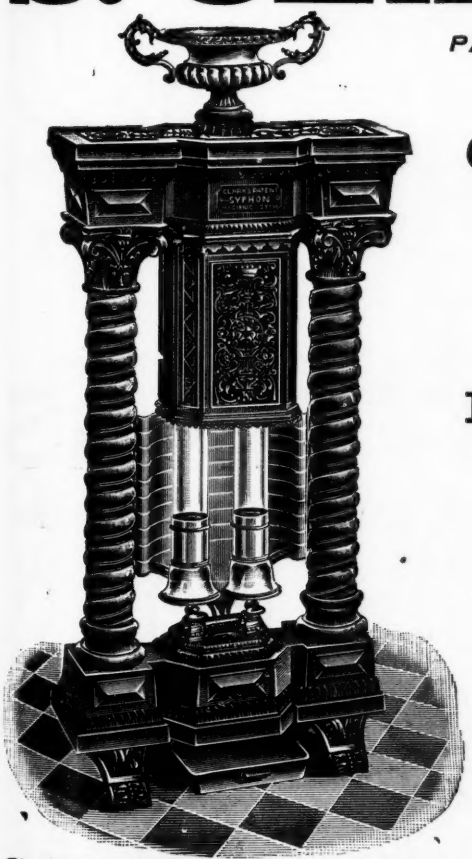

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CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Nov.* 26.

Sulphate of Ammonia.—The market has been quiet, and somewhat irregular; and low prices have had to be accepted, both at Liverpool and Hull. At the close, the tone is rather firmer; and the quotations are £9 17s. 6d. to £10 per ton at the ports. There has been good inquiry from all points; but consumers' ideas everywhere are below current values, and comparatively little direct business has been done. A fair amount of buying has been going on for December delivery, at about the level of spot prices; but consumers, discouraged by low speculative quotations ahead, have had small part in it. For the early months of 1899, very little has been done; sellers and buyers' ideas of value being too divergent.

Nitrate of Soda is, owing to arrivals, rather easier on spot; ordinary quality being quoted 7s. 6d. per cwt., and fine 7s. 7½d.

LONDON, *Nov.* 26.

Tar Products.—There is no change in the value of benzol; and its low price is opening new outlets for it in various directions. Very large quantities indeed are now being used for enriching gas; gas manufacturers having now satisfied themselves that it is very much cheaper either than carburetted gas or petroleum spirit for increasing illuminating power. It is the most natural product for this purpose; and to get the best and most economical effect, it should be applied to poor gas and not to gas already saturated with it, and of comparatively high illuminating power. If applied to rich gas, it is apt to condense out with a change of temperature, as gas is supersaturated with 3 per cent. Ordinary 16-candle gas contains about 2 per cent. of benzol to start with. In this direction doubtless the over-production of benzol will disappear. There is a steady market for naphthas. Carbolic acid is not quite so strong. Creosote continues firm; and pitch is steady in all positions. A little more inquiry is noted in the anthracene market; but so far there is no change for the better in its value.

Prices obtaining during the week are: Tar, 14s. 6d. to 20s. Pitch, east coast, 25s.; west coast, 22s. Benzol, 90's, 8½d.; 50's, 8¼d. Toluol, 1s. Solvent naphtha, 1s. 2d. Heavy naphtha, 1s. 1½d. Crude, 30 per cent. naphtha, 3½d. Creosote, 3d. Heavy oils, 45s. Carbolic acid, 60's, 1s. 10½d.; Creosote salts, 30s. Anthracene, nominal, "A," 4d.; "B," 3d.

Sulphate of Ammonia is moderately steady at £10 per ton, less 3½ per cent. at all ports. A determined effort is being made to depress this article, but the available quantity, having regard to the greatly increased demand, is so small that lower prices are improbable, especially if makers do not unnecessarily press the article on the market. There is sure to be a large home consumption during the ensuing season, owing to the action of the Suphate of Ammonia Committee. The home market during the past year, from the same cause, was much enlarged. Nitrate is reported firm, which should influence for good the position of ammonia.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—Inquiries for all descriptions of fuel throughout this district are steadily briskening up; the better qualities of round coal moving away more freely, while other classes are in exceptionally pressing request. The activity which prevails throughout all the principal coal-using industries is, of course, bringing forward considerable demands upon the lower descriptions of round coal, while there are large inquiries for engine fuel, and all descriptions of slack show a decided hardening tendency. Pits throughout Lancashire are on full time, with all the output moving away; and as stocks are exceptionally low, there is every indication of a very strong tone in prices during the ensuing winter. For round coals, current prices are without really quotable change, but exceedingly firm at the maximum list rates. Best Wigan Arley is not quoted under 11s. to 11s. 6d. per ton at the pit; Pemberton four-feet and seconds Arley, 9s. 6d. to 10s. 6d.; and common round coal, from 7s. 9d. up to 8s. 6d. For engine fuel, advances are in many cases being quoted; and on forward contracts representatives of collieries, who have very little to offer, and in most cases are indifferent about entering into any heavy engagements, are holding out for 6d. to 9d. per ton over last year's prices. At the pit, common slack averages 3s. 6d. per ton; medium, 4s. 3d. to 4s. 9d., and best sorts, 5s. up to 5s. 6d. Coke is becoming scarce on the market; and makers have no difficulty in obtaining from 2s. 6d. to 3s. per ton above the prices which were being taken this time last year. The shipping trade in steam coals is moderate, with ordinary qualities averaging 9s. 3d. to 9s. 6d. per ton delivered at the Garston Docks or the High Level, Liverpool.

Northern Coal Trade.—There is a better demand for coal in the North-east; but the inclement weather has interfered with shipments, though most collieries have had full work. Best Northumbrian steam coals are a little easier than they have been, and may be quoted at from 9s. 3d. to 9s. 6d. per ton f.o.b. Second-class steam are about 6d. per ton lower; and steam smalls vary from 5s. to 5s. 3d. per ton. Gas coal continues to be delivered in very large quantities, so that there is little to sell at the current prices, which range from 9s. to 9s. 3d. per ton f.o.b. Some of the Northern producers of gas are in the market for supplies beyond their contract quantities. Prices of gas coke are unaltered since last report.

Scotch Coal Trade.—There is a slight improvement in the demand for coal; there being a greater disposition to contract forward. There is also a better foreign demand—probably the outcome of the more peaceful views which are prevailing. The prices quoted are: Main, 8s. to 8s. 3d. per ton f.o.b. Glasgow; ell, 8s. 9d. to 9s.; and splint, 8s. 9d. to 9s. The shipments for the week amounted to 170,410 tons—an increase of 4716 tons upon the preceding week, but a decrease of 9890 tons upon the corresponding week of last year. For the year to date, the total shipments have been 8,688,712 tons—an increase of 1,407,851 tons over the corresponding period of last year.

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Gas-Works Extensions at Brighouse.—At a meeting of the Brighouse Town Council last Wednesday, a report was presented by the Borough Gas Engineer (Mr. James Parkinson), for improving and extending the Mill Lane Gas-Works, at an estimated expenditure of £12,000. The chief item of cost is an installation of inclined retorts. Alderman Sugden, in moving the adoption of the report, remarked that the results of the past year's work in the Gas Department showed a profit of about £300, after charging 1s. 6d. per 1000 cubic feet for gas used in the public lamps, instead of 2s. 2d. as in previous years.

Brigg Gas-Works Purchase Question.—The ratepayers of Brigg do not appear to be entering very heartily into the proposal of the District Council to purchase the gas-works. For the consideration of the promotion of a Bill for the purpose, a meeting of owners and ratepayers was held on Monday last week; but there was only a meagre attendance. The necessary resolution was moved by Mr. J. Spring, the Chairman of the Council; and Mr. Symonds, the Chairman of the Gas Committee, seconded it. The opposition was led by Mr. H. M. Hett, who maintained that the proposal would lead to an increase of the rates, which, at a time when the drainage scheme was sure to be a heavy burden to the town, would be a very serious matter for the ratepayers. Among other speakers was Mr. Skevington, who remarked that the lawyers would get the best of the fight; and he thought the proposal originated with them. On the resolution being put it was lost; only 31 voting for it. A poll was demanded.

Gas Explosions in Street Boxes.—The Highways Committee of the London County Council reported at last Tuesday's meeting that on the 5th inst., while some men in the employ of The Gaslight and Coke Company were laying a service in the Strand, near Norfolk Street, one of them drove a steel wedge into the low-tension triple concentric main of the Metropolitan Electric Supply Company at that point, and so established a short-circuit on the main. There was no fuse upon the main; but one of the gun-metal connectors in a footway box at the corner of Clement's Lane became fused, and opened the circuit, when the fire ceased. While the main was on fire, the cover of a low-tension box adjoining the spot where the accident occurred was blown off; but it does not appear that this did any damage. The explosion was probably due to the ground being impregnated with gas, as the box had no connection with the main which was damaged. The Committee suggested to the Company that in future, when works are being carried out by gas or other companies in thoroughfares where mains are laid, a representative should be present to point out their positions, and so prevent their being interfered with or damaged accidentally. Another explosion took place on the 26th ult. in a box belonging to the same Company at the corner of Russell Street and Wellington Street, Strand. In this case no damage was done to person or property. The cause of the explosion could not be definitely ascertained; but it appeared to the Highways Committee to have been due to an accumulation of gas in the box, which was constructed some years ago. The Committee reported that they had given instructions to call the attention of the Company to the necessity for some additional means being adopted for preventing the accumulation of gas in the boxes and conduits.

The New Mills Water-Works Purchase Sanctioned by the Ratepayers.—The result of the poll of the ratepayers of New Mills on the question of sanctioning, or otherwise, the application of the District Council for parliamentary powers to purchase the water-works and construct new ones, estimated to cost nearly £40,000, was declared last Tuesday. By 629 votes to 222, the scheme was approved.

The Assessment of a Main Sewer.—A case of considerable importance to local authorities was recently decided at the Monmouthshire Quarter Sessions, held at Usk before Sir Henry Jackson and a bench of Magistrates. The main sewer, constructed by the Ystradyfodwg and Pontypridd Main Sewerage Board, runs through the parish of Rhymney, and discharges into the Bristol Channel. The Newport Union Assessment Committee recently brought this portion of the sewer into assessment, and put it down at £700 net rateable value. Against this assessment the Board appealed. They were represented by Mr. Boyle, Q.C., and Mr. A. J. Ram. The case of the Committee was conducted by Mr. Lewis Coward, and Mr. W. Daniell. Counsel for the appellants relied on the judgment given by Lord Herschell in the House of Lords in the appeal of the London County Council on the proper assessment of the West Ham sewer. There were long legal arguments on both sides; but in the end the Court gave judgment for the appellants, and decided that only a very short length of the sewer—owing to its construction—was rateable. They assessed this portion at £145 gross and £105 net rateable value, with costs to the appellants. Evidence was given by Mr. G. Humphreys-Davies, and Mr. A. L. Ryde for the appellants; and by Mr. Mason, and Mr. William Eve for the respondents.

Exeter Water Supply.—The proposals of the Exeter Corporation for improving the water supply of the city were the subject of an inquiry held recently by Mr. G. W. Wilcocks, one of the Inspectors of the Local Government Board. The Corporation propose to borrow £30,000 for the purpose. The Town Clerk (Mr. G. R. Shorto) explained that it was necessary to increase the means of filtration, and to provide an increased supply, particularly in the higher portions of the city. It was proposed to enlarge the conduit, increase the pumping power both of water and steam, and augment the capacity of the rising mains. All the water at present required could be carried by the existing mains, but only by an extravagant expenditure of power. The two filters at present in use were not sufficient; and a great strain was put on one when the other was thrown out of use for the purpose of being cleaned. The filters were at Danes' Castle in the city, and it was impossible to get ground for the provision of additions. The Corporation therefore proposed to construct the whole of the filter-beds on land adjoining the pumping-station at Pynes. They were to consist of two settling-tanks, each to contain 1½ million gallons, from which the water would be lifted an average of 8 feet to the filter-beds, which would be six in number, each having a superficial area of 12,000 feet. In place of the present conduit, a cast-iron main 2 ft. 6 in. in diameter would be laid. Altogether, the supply would be increased by about 25 per cent.; and with a normal flow of water, 3 million gallons would be raised daily. The plans were explained by the City Surveyor; and the Inspector afterwards visited the works.

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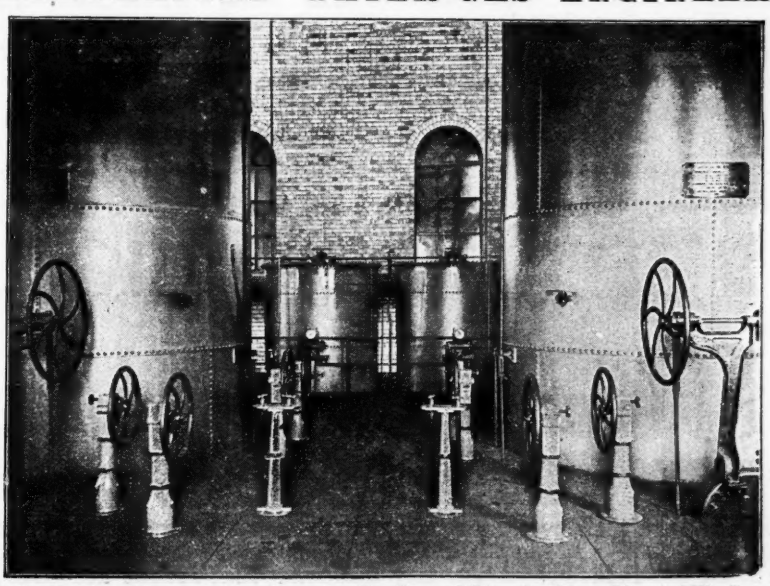

RESULTS PROVE EFFICIENCY.

Working Floor of Generator House. One Quarter Section of Birmingham Plant, Windsor Street Station.
The Maximum Daily Capacity of the Birmingham Corporation's Plant, which was erected by this Company, is 10 MILLION CUBIC FEET.

The Public Lighting of Windsor.—As the result of a discussion which took place in the Windsor Town Council last Wednesday, the main streets of the borough are to be lighted by electricity and gas, and the other parts by the incandescent gas system.

The Installation of Inclined Retorts at the Dewsbury Gas-Works has lately been visited by a number of gas engineers, among them being Mr. Corbet Woodall, who expressed an opinion of the settings which must have been highly gratifying to the Manager, Mr. C. A. Craven.

Burgess Hill Water Company.—The half-yearly report of this Company showed that £1086 was available for distribution; and a dividend of 3 per cent. per annum has been declared. The sum of £100 has been added to the reserve fund; and £287 has been carried forward.

The Water-Works Purchase Question at Maidstone.—The Maidstone Water Company have refused the offer of £150,000 for their undertaking made by the Maidstone Town Council, who, as will be seen by the abstracts of the parliamentary notices appearing elsewhere, are about to seek authority for the acquisition of the undertaking by them. At two meetings of ratepayers held last week, the project received support.

Gas Affairs at Cowes.—The Cowes District Council have received the sanction of the Local Government Board to the borrowing, for the purposes of the Gas Department, of £4947 on permanent works account for twenty-one years, and £2000 for working capital for ten years. The Gas Committee were empowered by the Council last Tuesday to negotiate a loan of £3500 for permanent works. The consumption of gas is growing at a satisfactory rate; the increase for the nine months ending Sept. 30 being 2,439,000 cubic feet, compared with the corresponding period of 1897.

Douglas Water Scheme.—The Douglas Corporation are applying for power to borrow £50,000 for the construction of a new reservoir in West Baldwin Valley. The present water supply, the source of which is at Onchan, is sufficient for all the probable demands that will be made upon it for some years; but in view of the growth of Douglas and its position as a health resort, it is thought advisable to have two distinct watersheds, and be able to meet almost any emergency. The two reservoirs now in use hold 73 million gallons; and the new reservoir is to have a capacity of 300 millions. The cost will increase the rates 3d. in the pound.

Welsbach Incandescent Gas-Light Company, Limited.—The Directors of this Company have decided to declare a dividend at the rate of 5 per cent. per annum on the preference stock for the half year ended Sept. 30. They have further resolved to pay a dividend at the rate of 7 per cent. per annum to March 31 on the amounts paid up on the ordinary stock in terms of the prospectus—*i.e.*, £1 6s. 7d. per £100 stock—and an interim dividend at the rate of 5 per cent. per annum for the six months ended Sept. 30; making together a sum of £3 16s. 7d. per £100 of ordinary stock. Both dividends will be paid, less tax, on Dec. 10.

The Suggested Purchase of the Wellingborough Gas-Works.—Referring to the proposal that the Wellingborough District Council should purchase the gas-works, a Northampton paper reports that the Company have named £120,000 as the price at which they would be willing to part with their property. It is pointed out that the profits of the Company would not yield more than 3 per cent. on £120,000; and the town would have to borrow the money for the purchase at probably that amount of interest. Therefore it follows that the principal would have to be repaid from the rates; and the townspeople are hardly in the mood to submit to a further increase in the rates for this purpose at the present time.

Leeds Corporation Gas Committee.—The *personnel* of the Leeds Corporation Gas Committee has been somewhat changed with the opening of the new municipal year. Dr. Heald takes the place of ex-Alderman Matthew Walker as Deputy-Chairman of the full Committee and Chairman of the Audit, Meters, and Mains Department. Alderman William Walker succeeds Mr. Phillip Heaton as head of the New Wortley Works Sub-Committee. Mr. Batley takes the position of Chairman of the York Street Works Sub-Committee, which was held last year by Dr. Heald; and the office of Chairman of the Workshops Committee, which Mr. Henry Scholefield filled prior to the elections, has been bestowed upon Mr. Ratcliffe. Mr. Francis Ambler continues Chairman of the Meadow Lane Works Committee, and Alderman Lowden again occupies the important and responsible position of Chairman of the full Gas Committee.

Duplicating the New Conveyor Company's Works.—An influential gathering assembled at the Transport Appliance Works, Smethwick, on Thursday, when the first principal of the new workshops of the New Conveyor Company, Limited, was placed in position. The ceremony of putting in the first bolt to fasten the principal to the supports was performed by Mr. Smith, and afterwards the company proceeded to inspect the works; Mr. Gilbert Little (the Managing Director) and Mr. Archie Little acting as guides. They were afterwards entertained by Mr. Little. The new workshop is 462 feet long. A new pattern shop and store is also being erected; and large drawing as well as general offices are to be built.

The Yearly Report on the Berlin Gas-Works.—The summary of the results of the working at the municipal gas-works at Berlin for the year 1897-8 has just been issued. The quantity of gas sold for illuminating purposes at 16 pf. per cubic metre (4s. 6½d. per 1000 cubic feet) showed an increase of 3·1 per cent. on the amount sold in the preceding year; while the increase in the gas sold for cooking, heating, and industrial purposes at 10 pf. per cubic metre (2s. 10d. per 1000 cubic feet) was no less than 22·85 per cent. The use of incandescent gas-burners for street lighting was largely extended; and hence the consumption of gas for public lighting actually exhibited considerable decrease. The profit handed over to the municipal treasurer amounted for the year to 5,582,897 marks (£279,145), which is about 17·34 per cent. greater than that realized in the preceding year.

The Purity of the Plymouth Water Supply.—Some alarm has been caused in Plymouth by reports that the water in the new storage reservoir at Burrator is, if not actually polluted, at least liable to pollution. The reservoir has been partly filled two or three times since it was completed in September; and the water then drawn off. A correspondent of one of the local papers who witnessed one of these emptyings described the water as "very dark in colour and clearly impure," while a most unpleasant stench emanated from the ground after the water was drawn off. This, he suggested, arose from the vegetable and other impurities of the land which was submerged, as well as from the drainage of about a dozen sets of farm buildings which will find its way into the water. Mr. E. Sandeman, the Corporation Water-Works Engineer, was interviewed on the subject. He explained that the course which was followed in filling the reservoir without attempting to clear the land of all the vegetable matter growing upon it is the usual one; and that the decomposed vegetable matter was comparatively harmless. The reservoir is now being filled for the fourth time, and the water is quite clear. As to the allegation that there was a stench from the land, Mr. Sandeman said that while there was in places a slight smell from the mud exposed to the sun, there was nothing more. He does not apprehend any trouble from the peat. The suggestion of danger of pollution from the farms he also made light of. He further pointed out that as the annual flow of water is sufficient to fill the reservoir ten times over, there will be nothing like stagnation of the water. Even in a dry summer the monthly inflow will be equal to one-fifth of the total capacity of the reservoir. In point of fact, Mr. Sandeman ridicules the suggestion that there is the least cause to apprehend unpleasant consequences from the impounding of the water which Plymouth has been consuming for three centuries, and has been praised as one of the purest and most abundant supplies in the kingdom.

Messrs. Biggs, Wall, and Co. have received a Government order for 400 street-lamps.

Messrs. W. J. Jenkins and Co., Limited, have secured the contract for erecting a new retort-stack at the Retford Corporation Gas-Works.

Owing to ill-health, Mr. J. W. C. Holmes, of Messrs. W. C. Holmes and Co., of Huddersfield, is retiring from the business, which will henceforth be carried on by Mr. P. F. Holmes under the same style.

The Chairman of the Great Yarmouth Gas Company (Mr. R. H. Inglis Palgrave) recently opened a cookery exhibition in the Temple School Room, under the auspices of the Company. Lectures and demonstrations were given by Miss Helen Edden twice daily, on stoves supplied by Messrs. Fletcher, Russell, and Co., Limited.

NOW READY.

Foolscap 4to, pp. 535, with 239 Illustrations and Steel-Plate Engraving (as Frontispiece) of WILLIAM MURDOCH, *Inventor of Gas Lighting. Morocco Gilt, 21s.; Roan Gilt, 18s.*

THE SIXTH (AND CENTENARY) EDITION OF THE

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FOR

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By THOMAS NEWBIGGING, M.Inst.C.E.

This Edition of the "Handbook for Gas Engineers and Managers" is a great improvement on all previous editions. Much of the text has been re-written, in order to keep the work abreast of the constant advances that are being made in the Gas Industry. About fifty additional Illustrations are given; and a Steel-Plate Engraving of William Murdoch, the Inventor of Gas Lighting.

LONDON: WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

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OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale than all other Oxides combined. Purity and uniformity of quality guaranteed.
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HUTCHINSON BROTHERS, Gas Engineers, &c., Falcon Works, Barnsley, Makers of Wet and Dry Gas-Meters, Brass-Work, and general Gas Apparatus, Lead Saturators, Tanks, &c., Tools, and Gas-Works Sundries. (See p. 1192, last week's issue.)
Telegrams: "HUTCHINSON BROS., BARNSLEY."

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BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

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JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.
For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
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BROTHERTON AND CO., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

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Two or three times as rich as Bog Ore.
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Write for tabulated results.
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JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER LINCOLN."
[For Illustrated Advertisement, see Nov. 1, p. 998.]

SADLER & CO., Ld., Middlesbrough; ULVERSTON (BARROW); PORTSMOUTH; CARLTON (N.E.R.); and STOCKTON. Tar and Petroleum Distillers. Benzol and Petroleum Spirit, 700 and other Gravities specially prepared for Carburetting. SOLAR OIL for Gas Making, Kerosene, &c.
Correspondence invited.
Telegraphic Address: "SADLER, MIDDLESBROUGH."

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Apply to the BRIMINGTON CARBON COMPANY, Sowerby Bridge, YORKS.

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REPAIR your old Retorts with Patent STICKFAST FIRE CEMENT. Unequalled for Repairing Inclines. Estimates for all kinds of Retort-Settings.
Write CROWTHER, Retort Setter, and Sole Maker of Stickfast Fire Cement, Manor Street, HUDDERSFIELD.

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Information and Handbook on application.
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WANTED, Carbon in 4 Ton Lots, or more; also OIL CARBON.
State Price, f.o.r. at nearest Station, to No. 3031, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. **Compare Prices and Particulars before ordering elsewhere.**
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OXIDE OF IRON BOG ORE.
BALE & CO.'S Oxide of uniform quality. SPECIAL FIRE CEMENT, OXIDE PAINTS, OILS, SULPHURIC ACID, &c.
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Telegrams: "BOGORE, LONDON."

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JOHN ROMANS & SON, EDINBURGH, Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.
Prices, &c., will be forwarded on application to No. 30, ST. ANDREW SQUARE, EDINBURGH, / NEWTON GRANGE, NEWBATTLE, DALKEITH, } SCOTLAND.

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JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c., CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special attention to Repairs.
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Telegraphic Address: "SATURATORS, BOLTON."

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BEG to offer their Incandescent Gas-LIGHT MANTLES AND BURNERS at Lowest Quotations.
Unrivalled quality warranted.

CRICKET, 1899.—"Richmond" Cricket CLUB want FIXTURES for next Season, preferably with London and Suburban Gas Companies' Teams; two elevens; home and away matches. Ground near Leyton, Essex.
Address CRICKET CLUB SECRETARY, Richmond and Co, Limited, 132, QUEEN VICTORIA STREET, E.C.

WANTED, by a thoroughly practical Man, a Situation as SULPHATE OF AMMONIA MAKER. Experienced in all the latest Improvements. Total Abstainer.
Address No. 3172, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SITUATION wanted by a reliable and experienced Man (Married) as MAIN and SERVICE LAYER, &c. Experienced in Automatic Fitting, Stoves, Meters, General Fitting, and Indexing. Has had charge of small Works. Permanency required. Good References.
Address No. 3174, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

DISTRIBUTING FOREMAN.
WANTED, immediately, by a Suburban Gas Company, a GENERAL FOREMAN to take charge, under the Engineer, of the Distributing Department. Must be of good address, capable of controlling Men, have had good experience in Main and Service Work, fixing and testing Meters, Internal Fitting Work, and capable of conferring with and advising Consumers.
Applications, in own handwriting, with *copies* of not more than three recent Testimonials, stating Salary required, Qualifications, &c., to No. 3170, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GWYNNE & BEALE'S
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GAS-EXHAUSTERS AND STEAM-ENGINES
FOR FULL PARTICULARS, APPLY TO THE MAKERS:
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Telegrams: "GWYNNEGRAM, LONDON."
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BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

ADVERTISER wants position in a Provincial Gas or Water Works as ASSISTANT MANAGER or ASSISTANT. Articled to Civil Engineer and Four Years' Experience in Works and Drawing Office, &c. Age 25. Holder of City and Guilds Gas Manufacture Certificate. Good References.
Apply, by letter, to No. 3164, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Gas-Fitter (good, competent Man) to lay Services and fit up Houses complete either in Compo. or Iron.
Applications, stating Terms and References, to be addressed to the MANAGER, Gas-Works, ROMFORD.

WANTED, by a Gas Company in South Wales, a GAS-FITTER and MAIN and SERVICE LAYER. Must be capable of reading Meter Indices.
Apply, by letter, stating Age, Wages, &c., to No. 3163, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WORKING Manager required for a Gas and Water Works in a Provincial Town in the South of England, with a population of about 6000. Wages £2 per week, with House, Gas, and Fuel.
Apply, by letter, to No. 3171, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, in an Office, a Gas Engineer who knows Chemistry, can conduct Experiments, and can write well on Technical Subjects.
Letter, stating Age, Experience, References, and Salary required, to No. 3168, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Draughtsman, by a Leeds Firm of Gas-Works Contractors. Must have a knowledge of Conveying Machinery and Inclined Retorts.
Apply, stating Age, Experience, and Salary required (in confidence), to No. 3167, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TONBRIDGE GAS COMPANY.

WANTED, a thoroughly competent GAS-FITTER, well up in Slot Work, fixing Cookers, Fires, &c. Permanent employment to a suitable Man.
Apply, stating Age, Experience, and Wages required, to the MANAGER, Gas-Works, TONBRIDGE.

WANTED, at a large Provincial Gas- Works, an intelligent Young Man (Age 25 to 30) as WORKS FITTER. One who would be willing to make himself generally useful, and has had some experience of Retort-House Work. Must have good Character.
Address No. 3173, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, at once, by a Gas and Water Company in Yorkshire, a reliable GAS-WORKS FITTER. Must be steady and obliging, accustomed to Gas and Steam Engines, repairs of Works, and able to do Smithing preferred.
Apply, by letter, stating Wages, Age, and enclosing References, to No. 3169, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TAR CONTRACT.

THE Aldershot Gas and Water Com- pany are prepared to receive TENDERS for the surplus TAR produced at their Gas-Works, from the 1st of January to the 31st of December, 1899.
Coal consumed, about 15,000 Tons.
Tenders, marked "Tar," to be addressed to the Secretary, Gas and Water Company, Victoria Road, Aldershot, on or before the 13th of December prox.

WORKING FOREMAN STOKER.

WANTED, Two experienced Young Men at a Works on the South Coast. Must be steady and reliable, used to Shovel Charging, Generator Furnaces, Engine, Exhausters, and Boiler, and Governor. To have charge of three or four Stokers on each Shift, working nights alternate weeks. Wages to commence, 27s. per week.
Address No. 3175, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS AND WATER WORKS.

THE Ambleside Urban District Council require a competent MANAGER for their Gas and Water Works.
The successful candidate will be required to devote the whole of his time to the duties of his office, and to superintend the work of a Clerk who will be appointed to keep the Books and collect the Accounts.
The Salary will be £125 per annum, such sum to include everything. Neither House, Coal, nor Gas will be provided.
All applications must be made by letter to the undersigned, enclosing Testimonials, not later than the 30th inst.
Personal canvassing of the members is strictly prohibited.

GEORGE GATEY,
Clerk to the Council.

Ambleside, Nov. 10, 1898.

FOR SALE—10 Tons of Hydrocarbon.
Apply STORE-KEEPER, L. & Y. Ry. Company, Osborne Street, MANCHESTER.

FOR SALE—A Sulphate of Ammonia Plant, suitable for Works carbonizing 4000 Tons of Coal per annum. Built by Abbott & Co., London.
Apply to the CLIFTON AND KERSLEY COAL COMPANY, LIMITED, Clifton, MANCHESTER.

BOROUGH OF NEWBURY GAS UNDERTAKING.

THE Corporation of the Borough of Newbury desire the services of a MANAGER who will be required to undertake the duties of the post on the 16th of January, 1899. A Salary of £200 per year will be paid; and the person appointed will be required to devote all his time to the duties of the Office—the engagement to be determinable by Three Calendar Months' Notice on either side.
Applications, endorsed "Gas-Works Manager," stating Age, Experience, and accompanied by *copies* of not more than *three* recent Testimonials, to be sent to me, the undersigned, not later than the 3rd of December next.
Canvassing will be considered a disqualification.

F. QUEKETT LOUCH,
Town Clerk.

Newbury, November, 1898.

THE Broadstairs Gas Company invite TENDERS for about 15 Tons of SULPHATE OF AMMONIA, delivered into Trucks at Broadstairs Station.
Tenders to be delivered not later than Dec. 6 next, addressed to the Chairman.
The Directors do not bind themselves to accept the highest or any Tender.

W. J. LATCHFORD,
Secretary and Manager.

Gas Offices, Broadstairs,
Nov. 25, 1898.

RADCLIFFE AND PILKINGTON GAS COMPANY.

TENDERS FOR PIPES.

THE Directors of this Company invite TENDERS for the supply of 500 4-inch CAST-IRON GAS-MAINS.
Further Particulars may be obtained from the undersigned, by whom Tenders will be received until Tuesday, the 6th day of December next.

JAMES BRADDOCK,
Manager and Secretary.

Gas-Works, Radcliffe,
Nov. 26, 1898.

THE BRISTOL GAS COMPANY.

FIRE-CLAY GOODS.

THE Directors are prepared to consider APPLICATIONS for the supply of their requirements of THE ABOVE during the Year next ensuing.
Particulars, with Forms of Tender, may be obtained on application to the undersigned, to whom also Tenders, sealed and endorsed "Tender for Fire-Clay Goods," must be delivered not later than Wednesday, the 7th day of December next.
The lowest or any Tender will not necessarily be accepted.

JOHN PHILLIPS,
Secretary.

Chief Offices: Canons' Marsh,
Bristol, Nov. 25, 1898.

THE Gas Committee of the Corporation of Heywood are prepared to receive TENDERS for the supply of FIRE-CLAY GOODS.
Specification, Quantities, and Form of Tender may be obtained on application to Mr. W. Whatmough, Gas Manager.
Contractors tendering for this work must pay their workpeople at least the Standard or Trade Union Rate of Wages, and observe the Trade Conditions which attach to the various kinds of work for which the Tender is sent in.
Tenders, endorsed "Fire-Clay Goods," to be sent to me not later than Tuesday, Dec. 13, 1898.

By order,
J. H. BALDWICK,
Town Clerk.

Municipal Buildings,
Heywood, Nov. 17, 1898.

RURAL DISTRICT COUNCIL OF CHORLEY.

TENDERS are invited for the supply of—
13 Long-dock HYDRANTS, Blakeborough Pattern;
8 SLUICE VALVES, 4 inches;
8 SLUICE VALVES, 3 inches;
13 HYDRANT COVERS;
16 VALVE COVERS for Water-Mains.
Particulars may be obtained at the Office of Mr. Alban Jolly, Surveyor to the Council, at 9, High Street, Chorley.
Sealed Tenders to be sent in to the undersigned on or before the 5th day of December next.

B. STANTON,
Clerk.

High Street, Chorley,
Nov. 22, 1898.

NOTICE is Hereby Given, that the HALF-YEARLY GENERAL MEETING of the Governor and Company of Chelsea Water-Works will be held at their Office, Commercial Road, Pimlico, in the County of London, on Thursday, the 22nd day of December prox., at One o'clock in the Afternoon precisely, for the General Business of the Company.
The REGISTER OF TRANSFERS WILL BE CLOSED between the 10th day of December prox., and the 22nd day of December prox., both days inclusive.
And Notice is Hereby further Given, that as soon as such General Business is disposed of or adjourned, an EXTRAORDINARY GENERAL MEETING of the Company will be held at the same place, for the purpose of passing a Resolution authorizing the creation and issue of NEW ORDINARY SHARES of the Company to the extent, in nominal value, of £34,215, at such Premium and on such Terms and Conditions and otherwise, as the Board of Directors may deem expedient, instead of borrowing the amount under the Company's Borrowing Powers, or under the Resolution for the issue of Debenture Stock passed at a General Meeting of the Company held on the 26th day of June, 1873.

By order,
G. H. GILL,
Secretary.

London, Nov. 29, 1898.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held MONTHLY, at the Mart, Tokenhouse Yard, E.C.
He also undertakes the issuing by Auction of Gas and Water Stocks and Shares under Parliamentary Powers.
Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. Alfred Richards's Offices, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of
THE GASLIGHT AND COKE COMPANY.

ISSUE OF £187,500 ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell BY AUCTION, at the Mart, Tokenhouse Yard, London, E.C., on Tuesday, Dec. 6, 1898, at Two o'clock precisely, in Lots,

£187,500 OF ORDINARY STOCK OF
THE GASLIGHT AND COKE COMPANY.

This Stock, which is issued under the Provisions of The Gaslight and Coke Company's Act of 1898, ranks for a Standard Dividend of 4 per cent. subject to the Sliding-Scale, and in view of the last distribution on the Company's issued "A" Ordinary Stock would be entitled to receive a Dividend at the rate of £4 18s. per cent.
Particulars may be obtained at the OFFICES OF THE COMPANY in Horseferry Road, WESTMINSTER, S.W. and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
NORTH MIDDLESEX GAS COMPANY.

500 £10 ORDINARY SHARES.

Ranking for a Standard Dividend of 7 per cent., subject to the Sliding-Scale—the last Dividend on similar Shares having been at this rate.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Dec. 13, at Two o'clock, in Lots.
Particulars of Messrs. MERRIMAN, PIKE, AND MERRIMAN, Solicitors, 25, AUSTIN FRIARS, E.C.; and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

131 £10 "B" SHARES (FULLY PAID) IN
THE BOURNEMOUTH GAS AND WATER COMPANY.

Ranking for a Maximum Dividend of 7 per cent.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Dec. 13, at Two o'clock, in Lots.
Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

CARDIFF GASLIGHT AND COKE COMPANY.
(INCORPORATED 5TH MAY, 1837.)

THE Directors of the Cardiff Gaslight and Coke Company Hereby Give Notice that they are prepared to receive, not later than Thursday, the 1st of December, 1898, Sealed TENDERS for
£10,000 "D" STOCK,
bearing a Maximum Dividend of 5 per cent. per annum, in pursuance of the Powers of the Cardiff Gas Act, 1887.
Conditions and Forms of Tender, together with further Information, may be obtained on application to the undersigned.

By order,
GEORGE CLARRY,
Secretary.

Gas Office, Cardiff,
Oct. 12, 1898.

LAMBETH WATER-WORKS COMPANY.

NOTICE is Hereby Given, that it is the intention of the Company to SELL BY TENDER £100,000 THREE PER CENT. DEBENTURE STOCK, redeemable at par by the Company on Six Months' Notice at any time after the expiration of 25 Years from the date of issue.
Particulars, Conditions of Sale, and Forms of Tender may be obtained at the Company's Office, Brixton Hill, S.W.
Sealed Tenders are to be delivered at the said Office not later than Twelve o'clock noon, on Monday, the 19th of December, 1898.

By order,
H. WILKINS,
Secretary.

Brixton Hill, S.W.,
Nov. 17, 1898.

EAST LONDON WATER-WORKS COMPANY.

ISSUE OF £150,000 THREE PER CENT. DEBENTURE STOCK.

MINIMUM PRICE, PAR.

NOTICE is Hereby Given, that the Directors are prepared to receive TENDERS for the ABOVE ISSUE (created under the East London Water-Works Act of 1897), bearing Interest at 3 per cent. per annum, less income-tax, and redeemable after the expiration of 25 Years from the date of Issue, subject to Six Months' Notice being given by the Company.
Tenders must be delivered at the Company's Offices, St. Helen's Place, Bishopsgate Street, E.C., not later than Eleven a.m., on Monday, Dec. 12 ensuing.
Particulars and Conditions, together with Form of Tender, may be obtained at the said Offices, or will be forwarded on application.

By order of the Court of Directors,
I. A. CROOKENDEN,
Secretary.

St. Helen's Place,
Bishopsgate Street, E.C.,
Nov. 15, 1898.

LIVERPOOL UNITED GASLIGHT COMPANY.

SALE OF NEW SEVEN PER CENT. STOCK.
TO BE SOLD BY AUCTION BY

MESSRS. BRANCH AND LEETE on Tuesday, the 13th day of December, 1898, at Twelve o'clock noon precisely, at the Law Association Rooms, Cook Street, in Liverpool, subject to the Conditions of Sale which will then be produced,

THE SUM OF £40,000 NEW STOCK
OF AND IN THE
LIVERPOOL UNITED GASLIGHT COMPANY
Created under the Powers of the Liverpool United Gaslight Company's Act, 1836.

The Stock will be offered in Lots of the nominal amount of £100 each, and will be issued to each purchaser as paid up Stock, after full payment of the purchase money.

For further Particulars, apply to Mr. J. F. ROBINSON, Treasurer, Gas Office, Duke Street; or to Messrs. GARNETT, TARBET, AND CO., Solicitors, Queen Insurance Buildings, Castle Street, LIVERPOOL.

YORK UNITED GASLIGHT COMPANY.

SALE BY TENDER OF NEW SHARES.
IN PURSUANCE OF THE YORK UNITED GASLIGHT COMPANY'S ACT, 1898.

NOTICE is Hereby Given, that it is the intention of the Directors of this Company to SELL BY TENDER 2000 NEW ORDINARY SHARES of the nominal value of Ten Pounds each, to bear a Maximum Dividend of £4 per cent. per annum, and to be paid up in full on or before the 31st day of January, 1899; being a portion of the Additional Capital authorized to be raised under the above-named Act.

There is no Preference Capital in front of the Ordinary Shares; and the 5 per cent. £10 Shares are quoted £13 to £13 5s.

Particulars and Conditions of Tender may be obtained on application at the Gas Company's Office, Davygate; and sealed Tenders must be sent in not later than Ten o'clock a.m., on Monday, the 12th day of December, 1898.

By order,
CHAS. SELLERS,
Secretary.

Gas Offices: Davygate, York,
Nov. 10, 1898.

THE SOUTH SHIELDS GAS COMPANY.

IMPORTANT SALE OF GAS STOCK.

MR. M. STAINTON is instructed by the Gas Company to SELL BY PUBLIC AUCTION, in the Board-Room, at the Gas Offices, Chapter Row, South Shields, on Monday, the 5th of December, 1898, at One o'clock p.m., prompt, £8000 of NEW STOCK, under the South Shields Gas Act, 1885.

The Stock will be put up in Lots of £100 each, nominal value. A Deposit of £10 per cent. to be paid on the purchase money at the Sale; the remainder to be paid to the Company's Bankers, the North-Eastern Banking Company, Limited, King Street, South Shields, on or before the 31st of December next.

The Stock will rank for Dividend from the 1st of January, 1899.

The Stock will be registered in the name of the Purchaser free of expense.

By order of the Directors,
J. H. PEARNEY,
Secretary.

Gas Offices, Chapter Row,
South Shields, November, 1898.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

COKE-BREAKERS,

PRICES REDUCED.
(THOMAS & SOMERVILLE'S PATENT)
With Elevators and Conveyors worked by Steam or Gas Engine.

GEORGE WALLER & CO.,
165, QUEEN VICTORIA STREET, E.C.
And at STROUD, GLOUCESTERSHIRE.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD
BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

THE Acetylene Illuminating Company, Limited, 63, Queen Victoria Street, London, E.C., GIVE NOTICE that they hold the BRITISH PATENT RIGHTS for the MANUFACTURE OF CALCIUM CARBIDE by means of the electric furnace, that they are bringing an action against the Midland Acetylene (Parent) Syndicate, Limited, to restrain them from so manufacturing that product, and that they intend in the future to bring actions against all infringers of these Patents and all purchasers or users of Carbide of Calcium made in infringement of the same.

NOTICE.

THE Acetylene Illuminating Company, Limited, having published and issued an advertisement or circular claiming that they hold the British Patents for the Manufacture of Calcium Carbide by means of the Electric Furnace, we guarantee to indemnify anyone who buys Carbide from us against any claim by "The Acetylene Illuminating Company, Limited," or anyone else.

READ HOLLIDAY AND SONS, LIMITED, Acetylene Gas Engineers and Carbide of Calcium Manufacturers, HUDDERSFIELD.

NOTICE.

THE Acetylene Illuminating Company, Limited, having published and issued an advertisement or circular claiming that they hold the British Patents for the Manufacture of Calcium Carbide by means of the Electric Furnace, we guarantee to indemnify anyone who buys Carbide from us against any claim by "The Acetylene Illuminating Company, Limited," or anyone else.

TINKER AND HOLLIDAY, LIMITED, Carbide of Calcium Manufacturers, HAZELHEAD, SHEFFIELD.

THE
ACETYLENE ILLUMINATING COMPANY, LTD.,
Manufacturers of Carbide of Calcium,
63, QUEEN VICTORIA STREET, LONDON, E.C.,
and FOYERS, SCOTLAND.

NOTICE.

MESSRS. Read Holliday & Sons, Ltd., of Huddersfield, and Messrs. Tinker, Holliday, & Co., Limited, of Hazelhead, Sheffield, having advertised that they are Manufacturers of Carbide of Calcium, and having guaranteed to indemnify anyone who buys Carbide from them, against any claim by the Acetylene Illuminating Company, Limited, Notice is Hereby Given by the Acetylene Illuminating Company, Limited, that they have been unable to secure any evidence, and do not believe, that either of the said Firms is, a Manufacturer of Carbide of Calcium.

The Acetylene Illuminating Company, Limited, for over two years, have been supplying Carbide to Messrs. Read Holliday & Sons. This Firm has, since advertising as above mentioned, ordered a further supply, which order the Acetylene Illuminating Company, Limited, have declined to execute in view of such advertisement.

On the Acetylene Illuminating Company, Limited, securing evidence that either of the above Firms, or any other Person or Firms are manufacturing or importing Carbide of Calcium, they will bring an action for Infringement of their Patent Rights.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For Prices, f.o.b. Ship or Delivered by Rail, apply to

THE WALLSEND & HEBBURN COAL COMPANY, LTD.
8 Lombard Street,
NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

ENRICH YOUR GAS
WITH
CHEAP BENZOL.

AT to-day's Price of Benzol, Illuminating POWER costs less than ONE-THIRD OF A PENNY PER CANDLE.

Apply to SADLER & CO., MIDDLESBROUGH.

DISPENSE WITH CANNEL COAL
and
INCREASE YOUR ILLUMINATING POWER
by using the

WHESSOE-MUNICH BENZOL CARBURETTER

The Cheapest and Best in the Market.

The Managers of Tynemouth, Middlesbrough, and Darlington Gas-Works are much pleased with it, and would not be without it.

Apply to the Sole Makers
THE WHESSOE FOUNDRY COMPANY, LIMITED,
DARLINGTON.

THOMAS TURTON
AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.
LONDON OFFICE:
90, CANNON STREET, E.C.

WELDON MUD
FOR
GAS PURIFICATION,
For use in the
RECOVERY OF SULPHUR,
ALSO
Removal of last Traces of SULPHURETTED HYDROGEN in catch position.

Full Particulars on application to the Patentees:
GAS DESULPHURIZATION CO.,
— LIMITED, —
1, FENCHURCH AVENUE, LONDON, E.C.

THE SILICA FIRE-BRICK
COMPANY,
OUGHTIBRIDGE, near SHEFFIELD,
MANUFACTURE
SILICA BLOCKS, BRICKS, AND CEMENT
OF SUPERIOR QUALITY
FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their
GREATER DURABILITY,
Strongly recommended where EXCESSIVE HEATS have to be maintained.

TROTTER, HAINES, & CORBETT,

Brettell's Estate

FIRE-CLAY & BRICK WORKS, STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Proprietors of

BEST GLASSHOUSE POT & CRUCIBLE CLAY.

Shipments Promptly and Carefully Executed.

London Office: R. Cull, 84, Old Broad St., E.C.

LONDONDERRY GAS COALS

FROM THE

MARQUIS OF LONDONDERRY'S COLLIERIES,

COUNTY OF DURHAM.

Available output up to 5000 tons per day
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by
Mr. John Pattinson, F.C.S., F.I.S.

For Prices and Particulars, apply to

S. J. DITCHFIELD,

SEAHAM HARBOUR, COUNTY OF DURHAM.

BOLDON GAS COALS.

ANALYSIS.

Yield of Gas per ton .	10,500	Cubic Feet.
Illuminating Power .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

For Prices, &c., apply to

W. H. PARKINSON,
THE HARTON COAL CO., LTD.,
NEWCASTLE-ON-TYNE.

Telegraphic Address: "PARKINSON NEWCASTLE."

HOLMSIDE GAS COALS.

Present Daily Produce over 5000 Tons.

Latest Analysis—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation

Yield of Gas per Ton . . . 11,205 Cubic Feet.
Illuminating Power $16\frac{7}{10}$ Stand. Sperm. Candl.
Coke (of good & pure quality) $13\frac{3}{4}$ Cwt. per Ton.
Sulphur . . . . . A little over 1 per Cent.
Ash . . . . . Under 1 per Cent.
Tar . . . . . 163 lbs. (Avoir.) per Ton.
Ammoniacal Liquor 103 lbs. (Avoir.) per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR

PELTON GAS COALS.

Present Daily Produce available 3000 Tons.

Of equal quality to the "Holmside" Coal, and also very largely used by many Gas Companies at Home and Abroad.

Both descriptions are shipped at Tyne Docks, and Dunston Staiths, River Tyne, also at North and South Docks, Sunderland.

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,

HOLMSIDE & SOUTH MOOR OFFICES, NEWCASTLE-UPON-TYNE.

WATERBLEAN PAINT

Telegrams: "EVESON, BIRMINGHAM."

EVESON FOR CANNEL

TUBES AND FITTINGS

ALL KINDS

WRITE FOR PRICES

STAFFORDSHIRE TUBE Co, BIRMINGHAM.

HEATHCOTE GAS COAL.

Rich in Illuminating Power and Yield of Gas. Above the Average in Weight and Quality of Coke.

Maintains a High Standard in Residuals.

THE GRASSMOOR CO., Ld.

CHESTERFIELD.

INCANDESCENT GAS LIGHTING.

Incandescent Burners from **5/6 per doz.**

Specially annealed best Fireproof Glass Chimneys (equal to the Jena.) 1/4 per Doz.

All other Incandescent Fittings at greatly reduced Prices.

Best "Comet" Bulbs, 3s. per Dozen.

Write for Illustrated Price Lists.

WHOLESALE FITTINGS COMPANY,
80, COMMERCIAL ROAD, LONDON, E.

JAMES OAKES & CO.

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

Note.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts and Covers, and rendering Leakage impossible.

THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON & COAL Co., Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by

Messrs. J. & H. S. PATTINSON, *May 28, 1895,*

Yield of Gas per Ton . .	10,500 Cub. Ft.
Illuminating Power . .	16·9 Candles.
Coke (of good quality) . .	67·5 per Cent.
Sulphur	0·58 „
Ash	2·78 „

For Price, &c., apply to the

WEARDALE IRON & COAL Co., Ld.

QUAYSIDE, NEWCASTLE-ON-TYNE.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on Application.

PRICE'S COKE & COAL BARROW

effects a great saving of time, labour, and expense.

For Particulars, Price, &c., apply to Mr. Edward Price, 119, Queen's Road, Finsbury Park, N.

Prices are Reduced.

INCANDESCENT GAS LIGHTING

Has now gained a complete and final **Victory** over its last and greatest Enemy

VIBRATION,

BY MEANS OF

CLAY'S PATENT

SHOCK-PROOF

Incandescent Burner Fittings

Of which full Particulars may be had from

CLAY & WALMSLEY,

BOLTON, ENGLAND.

Telegrams: "CLAYS, BOLTON."

See "Journal of Gas Lighting," July 7, 1896, p. 19, and Dec. 21, 1897, p. 1365.

London Representatives: H. Greene & Sons, Ltd., 153 & 155, Cannon Street, E.C.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE

BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to

THOS. W. DANCE & SONS,
Coal Owners, Newcastle-on-Tyne;
or
E. FOSTER & CO.,
21, John Street, Adelphi, London, W.C.

"HOLOPHANE" GLOBES.

Notice is Hereby Given, that in an Action in the Chancery Division of the High Court of Justice, in which "Holophane" Limited are Plaintiffs and the Agents in England for the sale of Heybrock's "Opterophane" Globes, are Defendants, the Honourable Mr. Justice Kekewich on the 22nd November, 1898, granted an Injunction restraining the Defendants, their Servants, and Agents from infringing the Paintiffs' Letters-Patent for "Holophane" Globes.

All Manufacturers of and Dealers in Globes and Shades are hereby warned that the Company will take proceedings against any person Manufacturing, Selling, Offering for Sale, or Supplying "Opterophane" Globes or any Globes or Shades infringing the Company's Patents.

Dated 23rd November, 1898.

DIXON, WATTS, & ELKIN,
Savoy Mansions,
The Savoy, W.C.
Solicitors for "Holophane" Limited.

Send Post-Card for new Catalogue and Trade Terms to "HOLOPHANE" LIMITED, 93, Queen Victoria Street, London, E.C.

JAMES MILNE & SON, LTD.

MILTON HOUSE WORKS EDINBURGH.

60, HOLBORN VIADUCT **LONDON.** | 111, ST. VINCENT STREET **GLASGOW.** | 48, WELLINGTON STREET **LEEDS.**

CONSUMERS' WET AND DRY GAS-METERS.

PREPAYMENT WET AND DRY GAS-METERS.

STATION GOVERNORS.

PRESSURE-REDUCERS.

ENGINES & EXHAUSTERS.

VALVES.

PRESSURE-GAUGES.

MAIN COCKS.

HARRIS & PEARSON,

STOURBRIDGE, ENGLAND,

MANUFACTURERS OF

FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description.

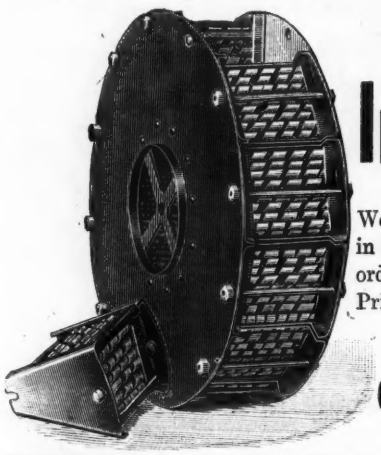
GLAZED BRICKS AND PORCELAIN BATHS.

STOKERS' GLOVES.

GEO. BOULTON & SON, Wholesale Glove Manufacturers, **75, Goswell Rd., London, E.C.**

Will be pleased to send Sample Patterns and Prices to the Managers and Engineers of Gas Companies, similar to those which have been supplied by them to the South Metropolitan Gas Co., The Gaslight and Coke Co., Commercial Gas Co., and others, for 30 years past.

ALL KINDS OF STOUT LEATHER GLOVES FOR FURNACE OR SMELTING WORKS MADE TO ORDER.



H. KIRKHAM & CO.'S

IMPROVED WASHER-SCRUBBERS

We guarantee every Machine to extract 20 per cent. more of the Impurities contained in the crude Gas than may be required in the application for Tenders. Please defer ordering until you have seen our Patent Washing Devices fitted in Patent Cages. Prices quoted for Washer-Scrubbers or for Renewals to all Machines of the Kirkham, Hulett, and Chandler type.

Office: 335, MANSION HOUSE CHAMBERS, QUEEN VICTORIA STREET,

LONDON, E.C.

HISLOP'S PATENT REGENERATIVE RETORT-SETTINGS

THESE SETTINGS SECURE THE RECORD PRODUCTION OF

1000 CUBIC FEET OF GAS PER LINEAL FOOT OF RETORT (Ordinary Section) per 24 HOURS from ENGLISH COAL, and

1200 CUBIC FEET FROM SCOTCH COAL,

DURABILITY AND SIMPLICITY OF MANAGEMENT. LOWEST POSSIBLE FUEL ACCOUNT. PERFECT SATISFACTION GUARANTEED.

Together with every other possible Advantage.

All Enquiries to be addressed to the PRINCIPAL AGENT,

R. F. HISLOP, Gas Engineer, CRAIGIELEA, PAISLEY.

HANNA, DONALD, & WILSON,

(Established 1851),

GAS ENGINEERS & CONTRACTORS,

Abercorn Foundry and Abbey Works,

PAISLEY, N.B.,

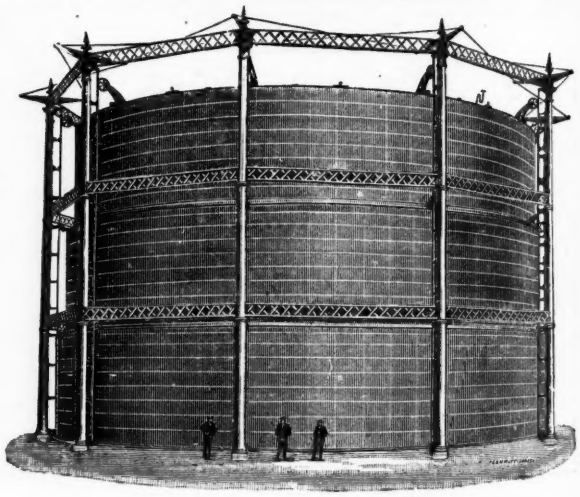
MAKERS OF

Gasholders and Gas Plant

OF EVERY DESCRIPTION.

Sole Agents for Scotland for the Automatic Coal-Gas Retort (Inclined System) Company, Limited.

Telegraphic Address: "Donald, Paisley."



SAWER & PURVES, NELSON METER WORKS, MILES PLATTING, MANCHESTER,

(BRANCH OF METERS LIMITED),

MANUFACTURERS OF

IMPROVED WET GAS-METERS IN CAST-IRON CASES,

THE UNVARYING WATER-LINE GAS-METER,

IMPROVED DRY GAS-METERS.

Speciality: PATENT CASH PREPAYMENT METERS.

CATALOGUE SENT ON APPLICATION.

MAURICE GRAHAM, Managing-Director.

Telegrams: "ACCOUPLE, LEEDS." "ACCOUPLE, LONDON."

GRAHAM, MORTON, & CO.

— LIMITED —

INCLINED RETORTS

AND ALL CLASSES OF

ELEVATING & CONVEYING MACHINERY.

— Contractors to Her Majesty's Government. —

Works: BLACK BULL STREET, LEEDS.

COAL UNLOADING AND CONVEYING MACHINERY.

Also Makers of

LIQUOR TANKS,
RACK AND SCREW VALVES,
HYDRAULIC HOISTS AND PUMPS,

AIR-COMPRESSORS,

MACHINERY FOR HORIZONTAL AND INCLINED RETORTS.
BUCKSTAVES, COLUMNS,
STAGE-FLOOR GIRDERS, &c.

RETORT MOUTHPIECES,

REGENERATIVE RETORT-SETTINGS.
ASCENSION, ARCH, AND DIP PIPES.
COAL AND CANNEL BREAKERS.
COKE BREAKERS AND SCREENS.

COKE STORING

AND SCREENING PLANT,
GAS COMPRESSORS AND EXHAUSTERS,
TUBULAR CONDENSERS,
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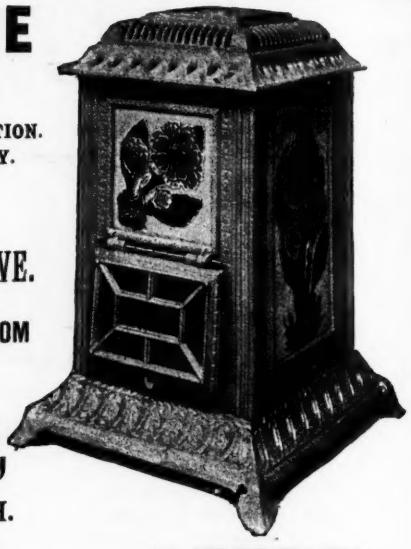

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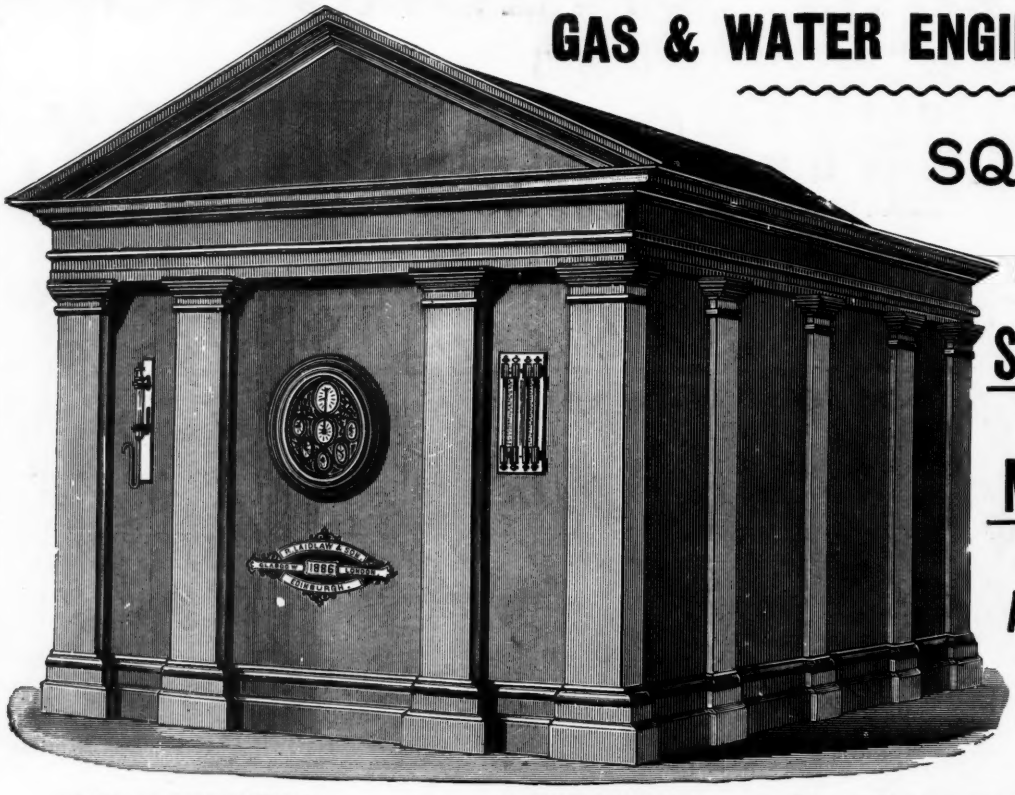

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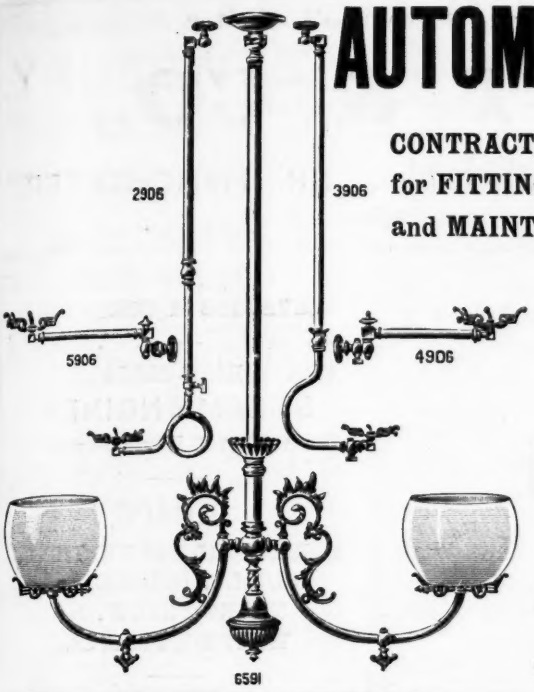

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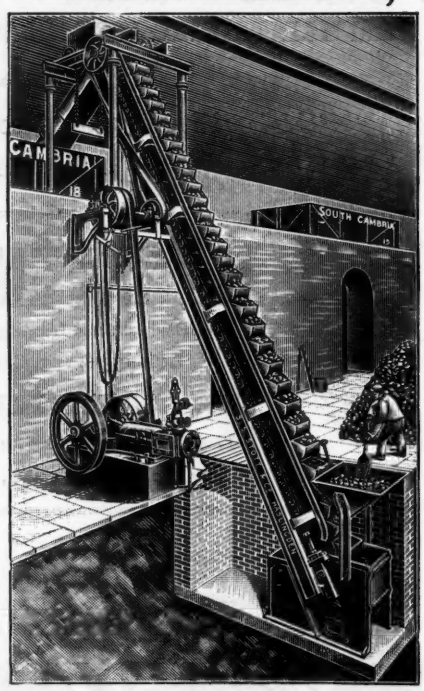

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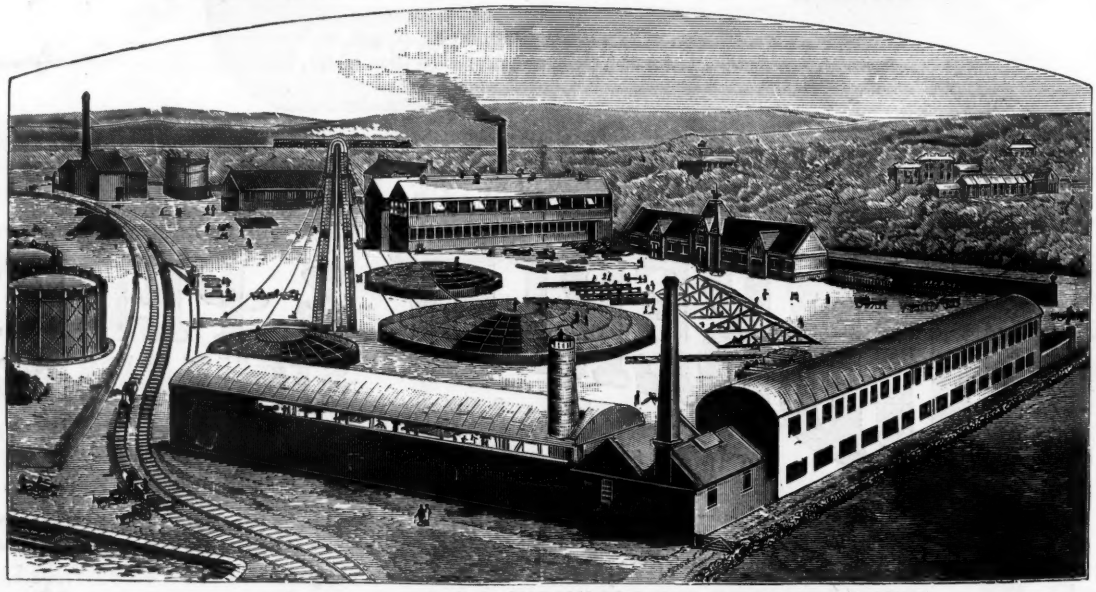

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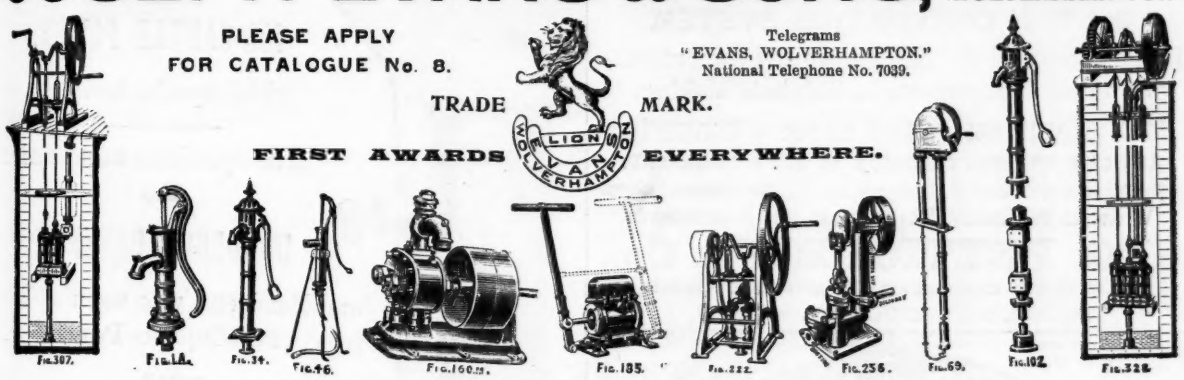

Fig.387. Fig.14a. Fig.34. Fig.46. Fig.160a. Fig.185. Fig.222. Fig.256. Fig.69. Fig.102. Fig.328.
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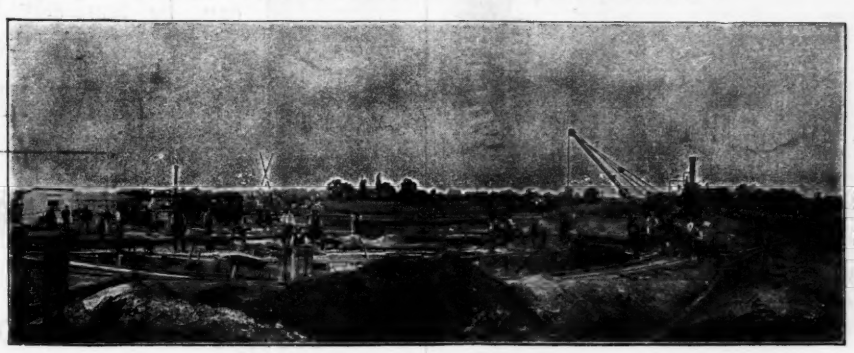
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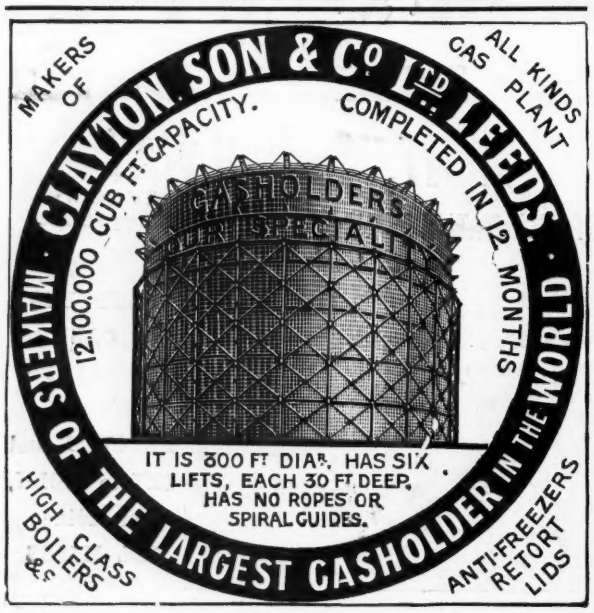
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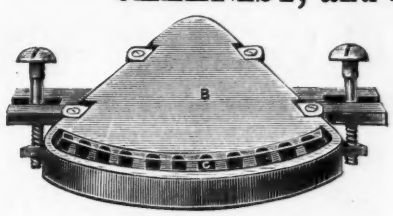

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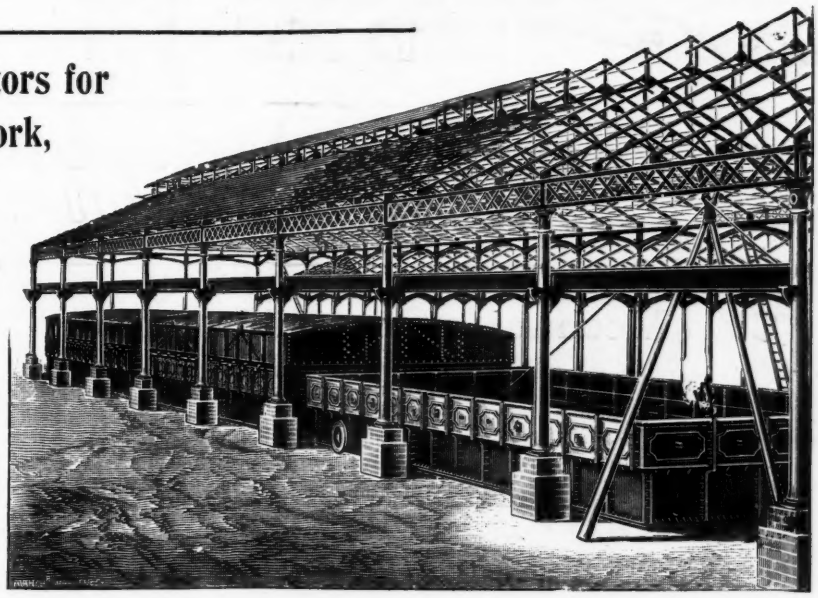

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